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FM 101-10

(PART I)

DEPARTMENT OF THE ARMY FIELD MANUAL

STAFF OFFICERS' FIELD MANUAL

ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA

PART I—UNCLASSIFIED DATA

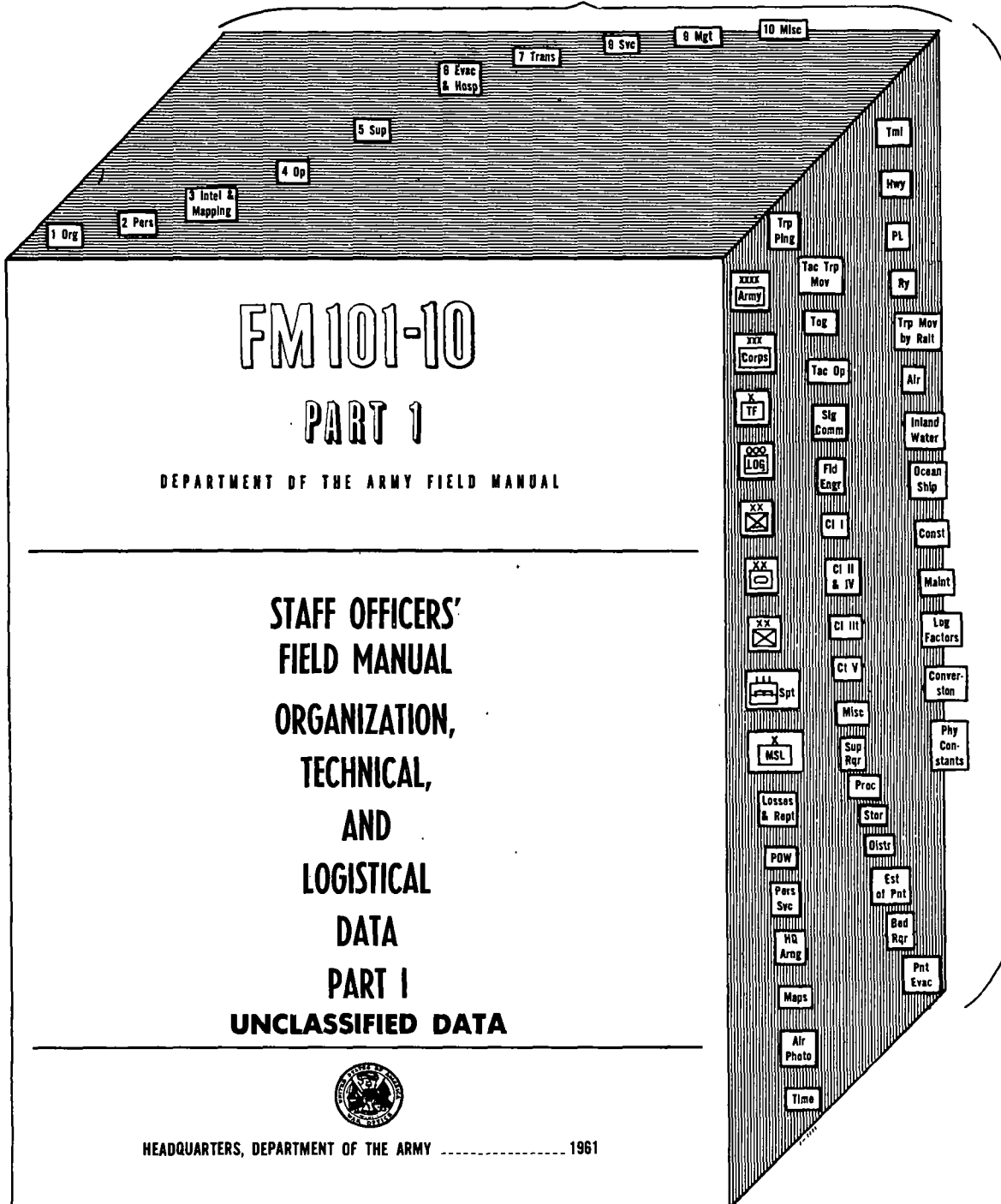


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HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1961

SUGGESTED METHOD OF PLACING INDEX TABS

Place Chapter Number Tabs on Top of Manual



**Place
Section
Tabs
Along
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of
Manual**

Chapter number and abbreviated title appear at the top of the page and are attached to the first page of the chapter. (Chapter separators of cover stock may be inserted between chapters if desired.) Abbreviated section titles within a chapter appear at the side of the manual and are attached to the page on which the particular section begins.

FOREWORD

FM 101-10, *Staff Officers' Field Manual—Organization, Technical, and Logistical Data*, consists of three parts published as separate volumes.

Part I —Unclassified Data

Part II —Extracts of Tables of Organization and Equipment.

Part III—Classified Data

PART I

This volume is for use as a planning guide only. It provides general planning data for staff officers of all echelons. Detailed reference data are found in tables of organization and equipment, field manuals, technical manuals, technical bulletins, and supply bulletins as outlined in the DA Pam 310-series. The principles and procedures of administration are contained in FM 100-10; the duties of staff officers and the principles and procedures of staff action are contained in FM 101-5.

When tons are shown, the short ton (2,000 lb) is intended unless the long ton (2,240 lb) or the measurement ton (40 cu ft) is specified.

For meaning of abbreviations and symbols used in this manual, see AR 320-50 and FM 21-30.

Caution: Data contained in this volume are based on experience principally from World War II and the Korean War and can be applied to the future only with judgment and discrimination. Planning factors should be modified, as appropriate, to reflect specific requirements of mission, environment, enemy capabilities, and nuclear conditions. Whenever known factors are available, they should be used rather than those from this volume. This volume is applicable to nuclear and nonnuclear warfare.

Tables and examples in chapters 1 through 9 are not, in all cases, based on latest tables of organization and equipment, and computations must be adjusted accordingly.

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to Commandant, United States Army Command and General Staff College, Fort Leavenworth, Kansas. See AR 310-3 for desired format of recommendations for corrections and changes.

United States Army Command and General Staff College will prepare and process changes to this manual on an annual basis.

Source data cutoff date for material contained in this volume is 1 May 1960.



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FIELD MANUAL
No. 101-10
PART I

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 25 October 1961

STAFF OFFICERS' FIELD MANUAL
ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA
PART I—UNCLASSIFIED DATA

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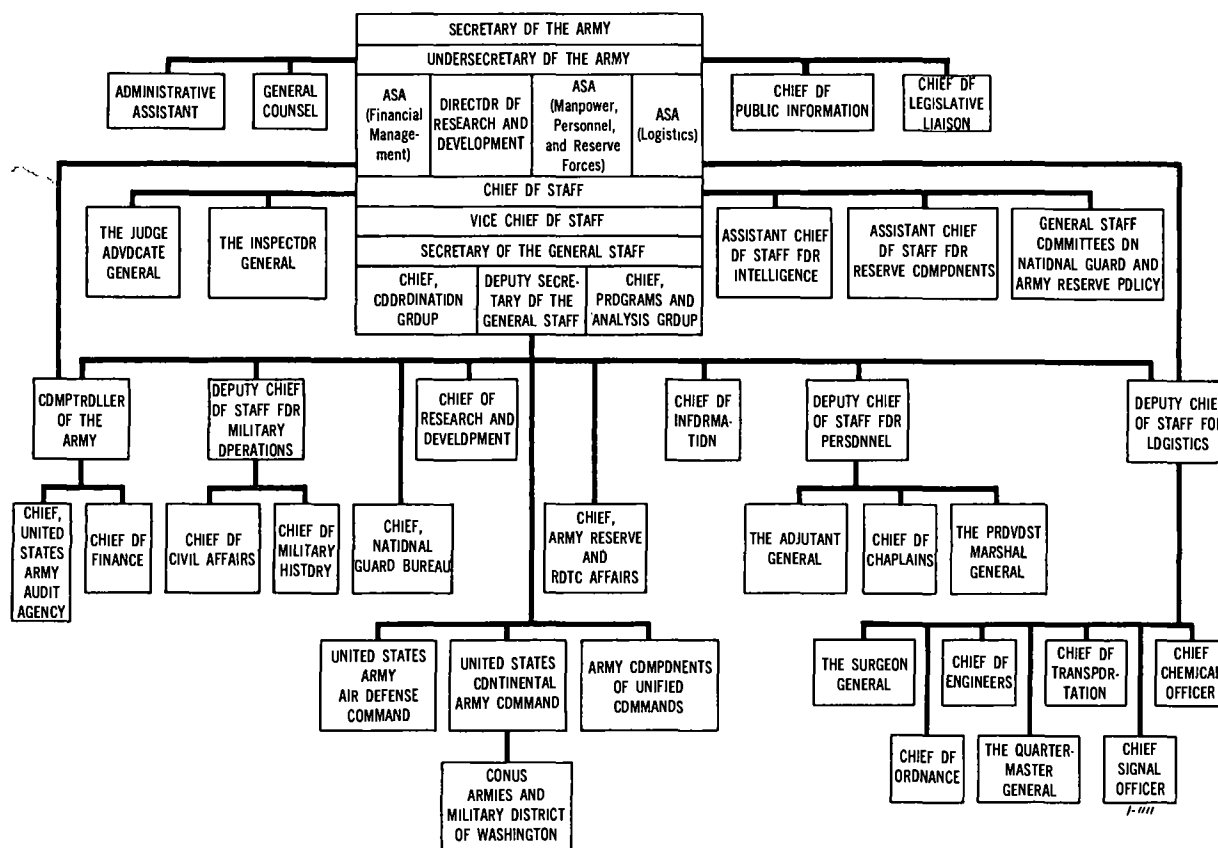
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CHAPTER 1

ORGANIZATION

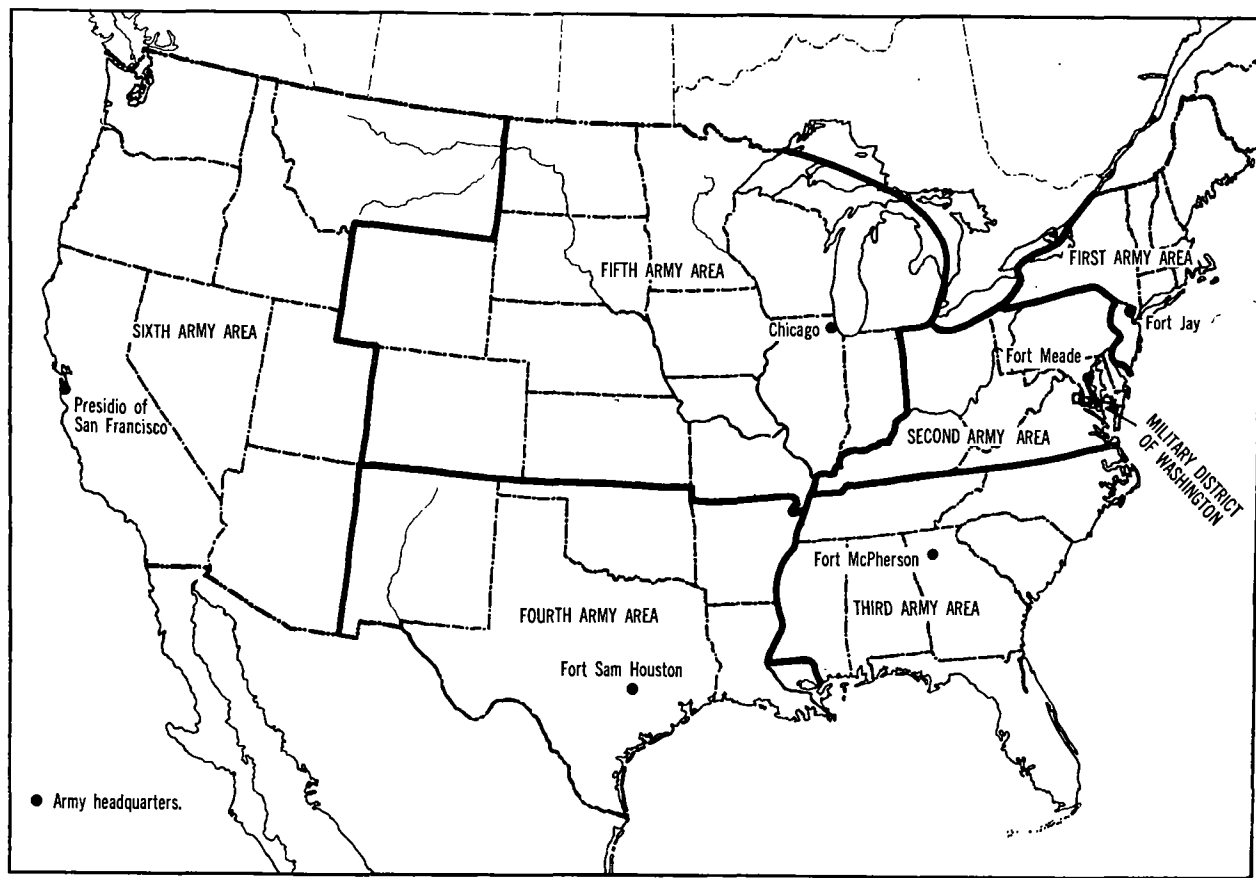
Section I. GENERAL

1.1. Department of the Army-Organization

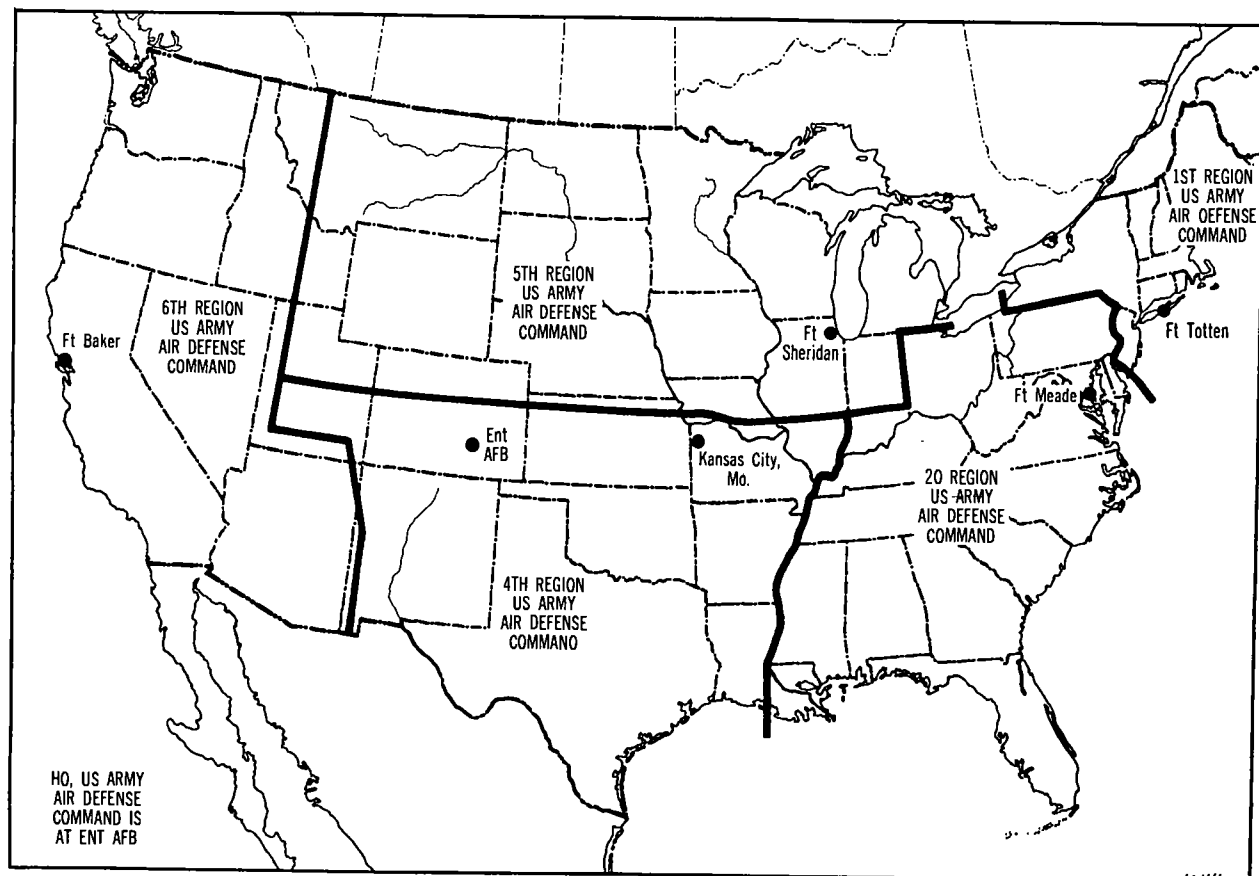


1.2. Army Areas and U.S. Army Air Defense Commands

a. Army Areas.



b. U.S. Army Air Defense Commands.



1.3. Theater Army

a. General. U.S. theater army headquarters is the senior U.S. Army headquarters in a theater of operations. In a theater where only U.S. forces comprise the theater command, U.S. theater army headquarters is charged with the overall supervision of strategic, tactical, administrative, and logistical operations of all U.S. Army elements. When the theater is organized as a combined command, U.S. theater army headquarters becomes, for all practical purposes, an administrative headquarters for the support of U.S. Army forces only.

b. Composition.

(1) *Headquarters.* There is no prescribed organization for headquarters, theater army. It consists of the headquarters elements necessary to provide command and control of assigned forces. The allotment and grouping of these

forces is based upon the mission assigned.

- (2) *Assigned forces.* Forces assigned to U.S. theater army may consist of—
- (a) Combat forces—army groups, field armies, separate corps, and, in some cases, divisions.
 - (b) Theater army logistical command (TALOG), with its subordinate logistical commands.
 - (c) Theater army replacement and training command.
 - (d) Theater army civil affairs command.
 - (e) Theater army air defense command.
 - (f) Theater army unconventional warfare (UW) command. (The theater army UW command may operate as a unilateral Army command under the theater army commander, may

operate as part of a joint task force under the theater commander, may be a uni-Service command under the theater commander, or Army UW elements may be provided to a joint task force designated as the theater UW command.)

1.4. Army Group

a. General. The army group is organized to direct the strategic and tactical operations of two or more field armies or similar tactical groupings. When only U.S. forces comprise the theater command, army group, if employed, operates under the direct control of the U.S. theater army commander. When operating as a part of a multinational theater, strategic

direction may originate in a superior land force headquarters.

b. Composition.

- (1) *Headquarters.* There is no prescribed organization for headquarters, army group. It is provided the headquarters elements necessary to exercise strategic and tactical control of its assigned forces. Army group does not normally operate administrative installations.
- (2) *Assigned forces.* Forces assigned to an army group may consist of—
 - (a) Field armies.
 - (b) Separate corps.
 - (c) Divisions.

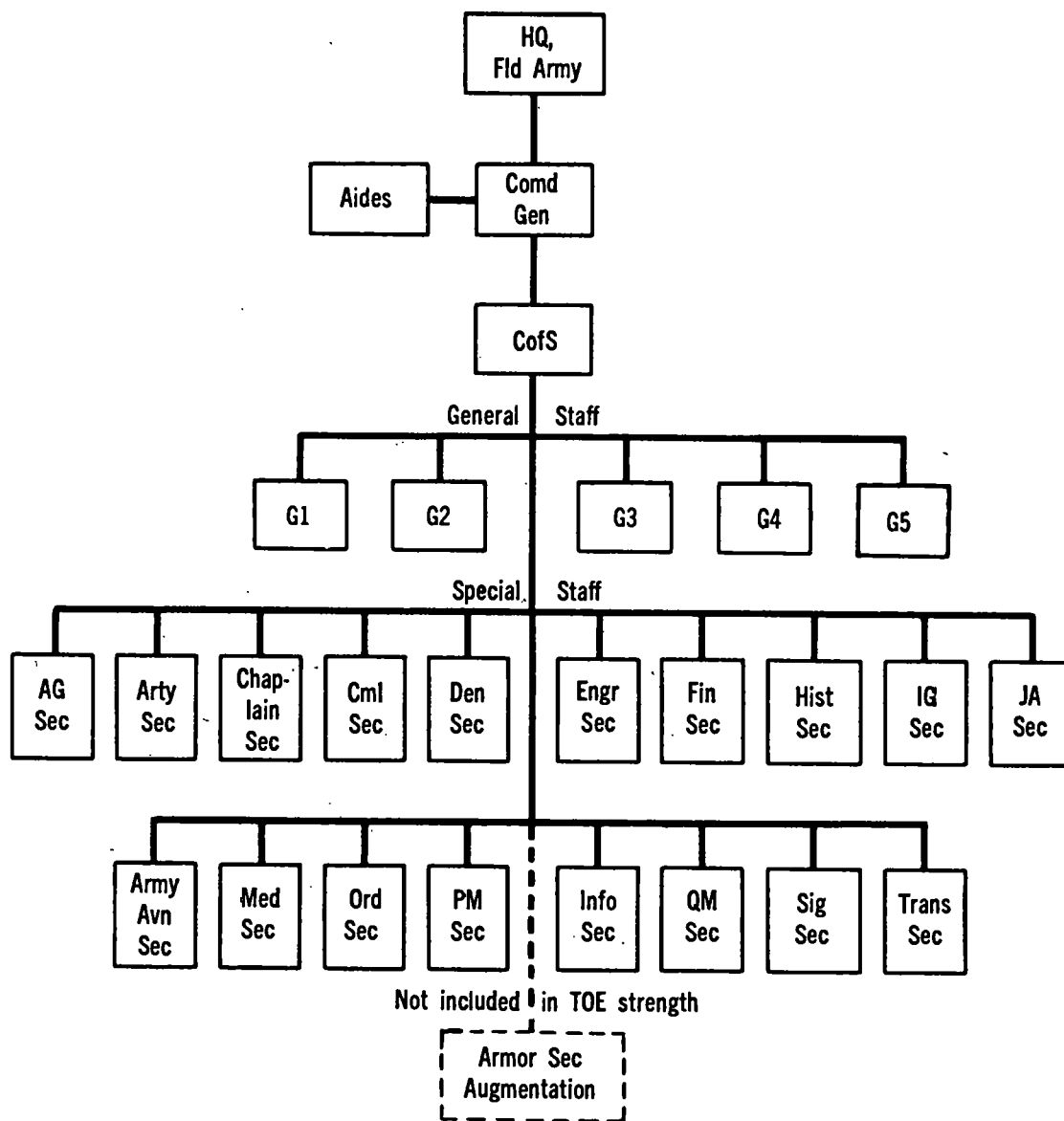
Section II. FIELD ARMY, CORPS, TASK FORCE, AND LOGISTICAL COMMAND

1.5. Field Army

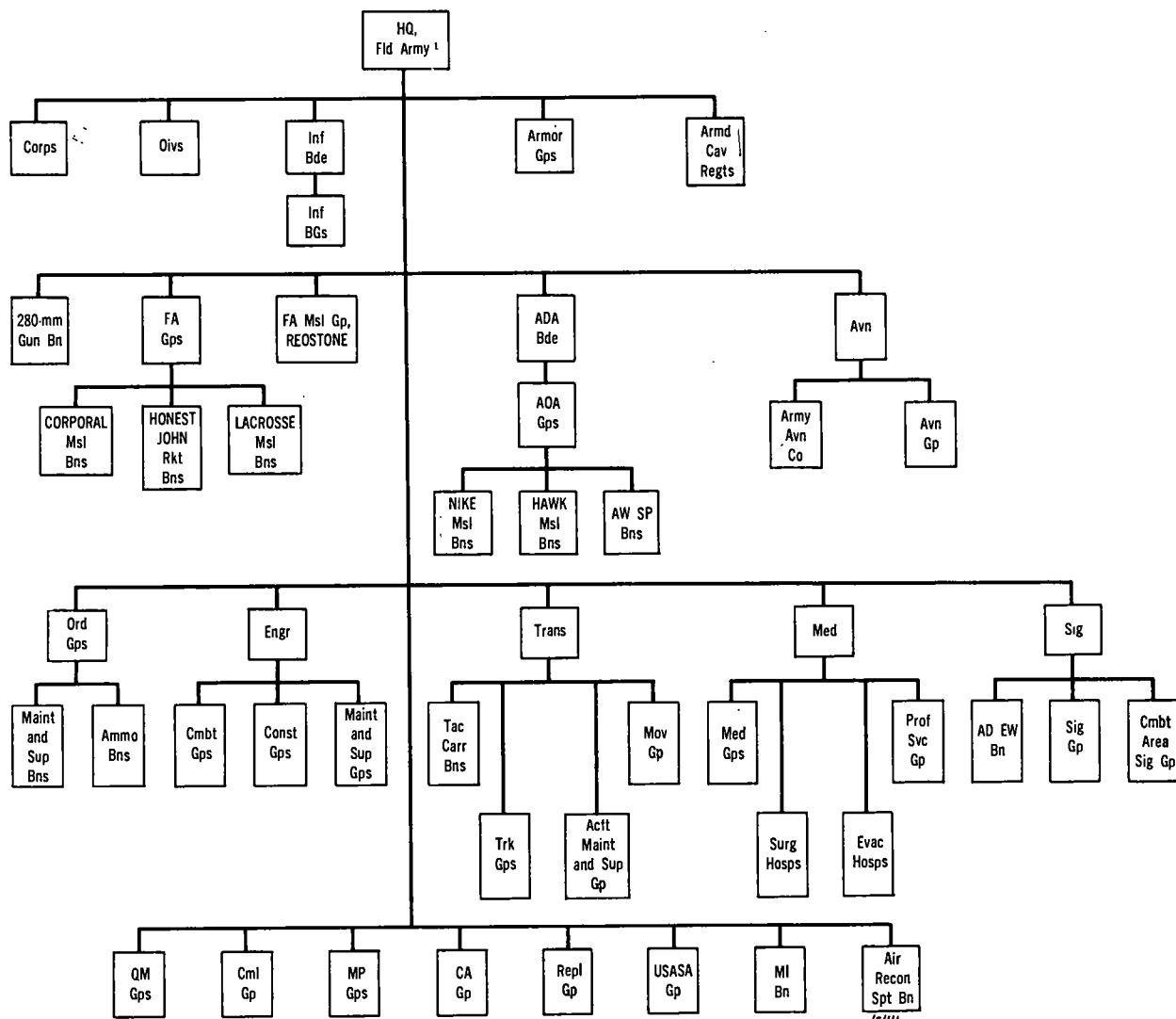
a. General. The field army is a flexible combat force capable of independent operations. Normally, it consists of a headquarters, assigned field army troops, two or more corps, and rein-

forcing combat and service troops. A field army normally exercises both tactical and administrative functions. For classified organizational data pertaining to the various type units found in a field army, see FM 101-10, part III, chapter 1.

b. Diagram of Field Army Headquarters, TOE 51-1C.



c. *Diagram of a Type Field Army Combat and Service Troops.* For composition of a type field army by branch, see paragraph 4.2..



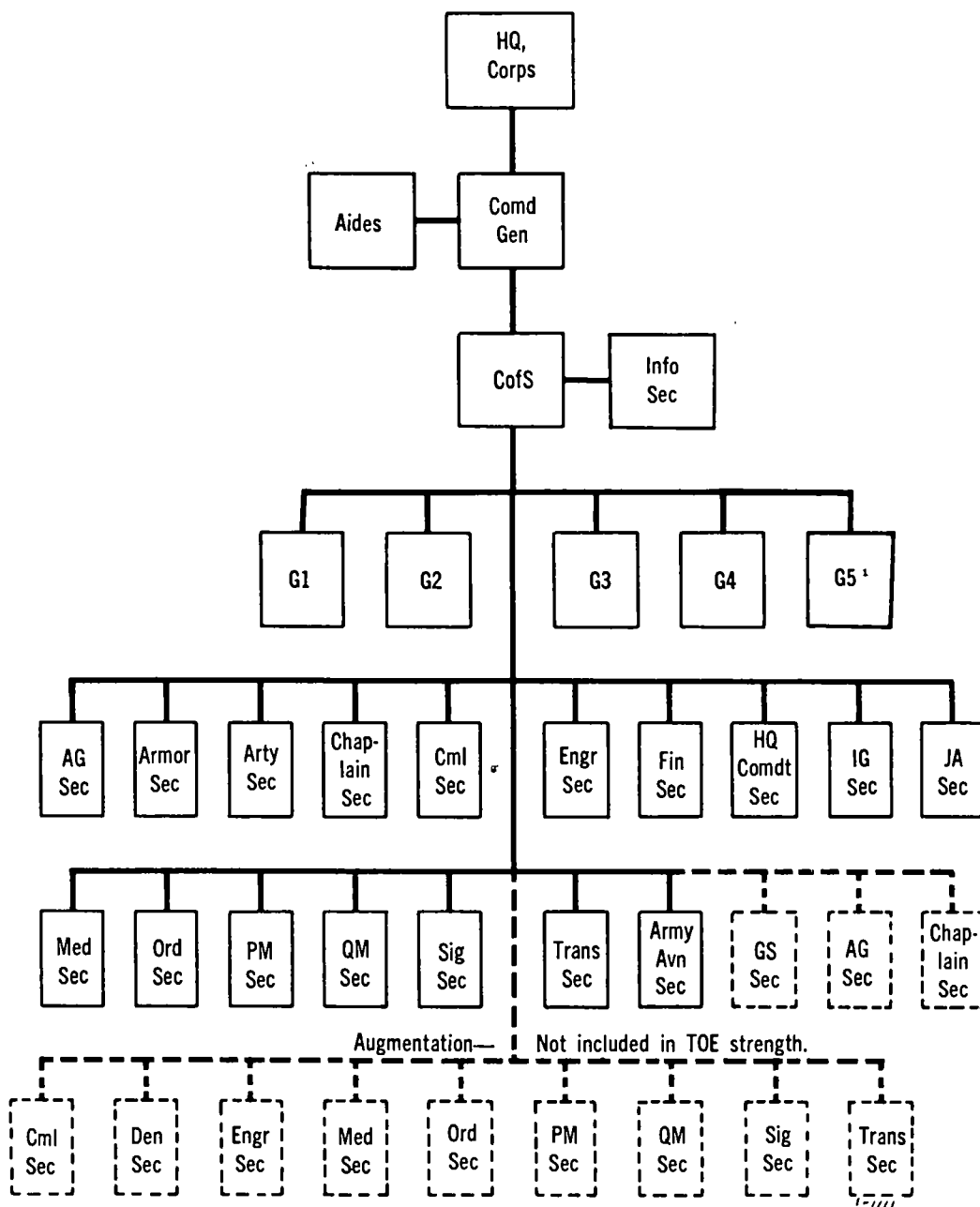
¹ In most instances, combat units are assigned to field army, with attachment to corps.

1.6. Corps

a. *General.* The corps is a flexible combat force consisting of a headquarters, assigned corps troops, two or more attached divisions, and reinforcing combat and service troops that may be attached in accordance with its mis-

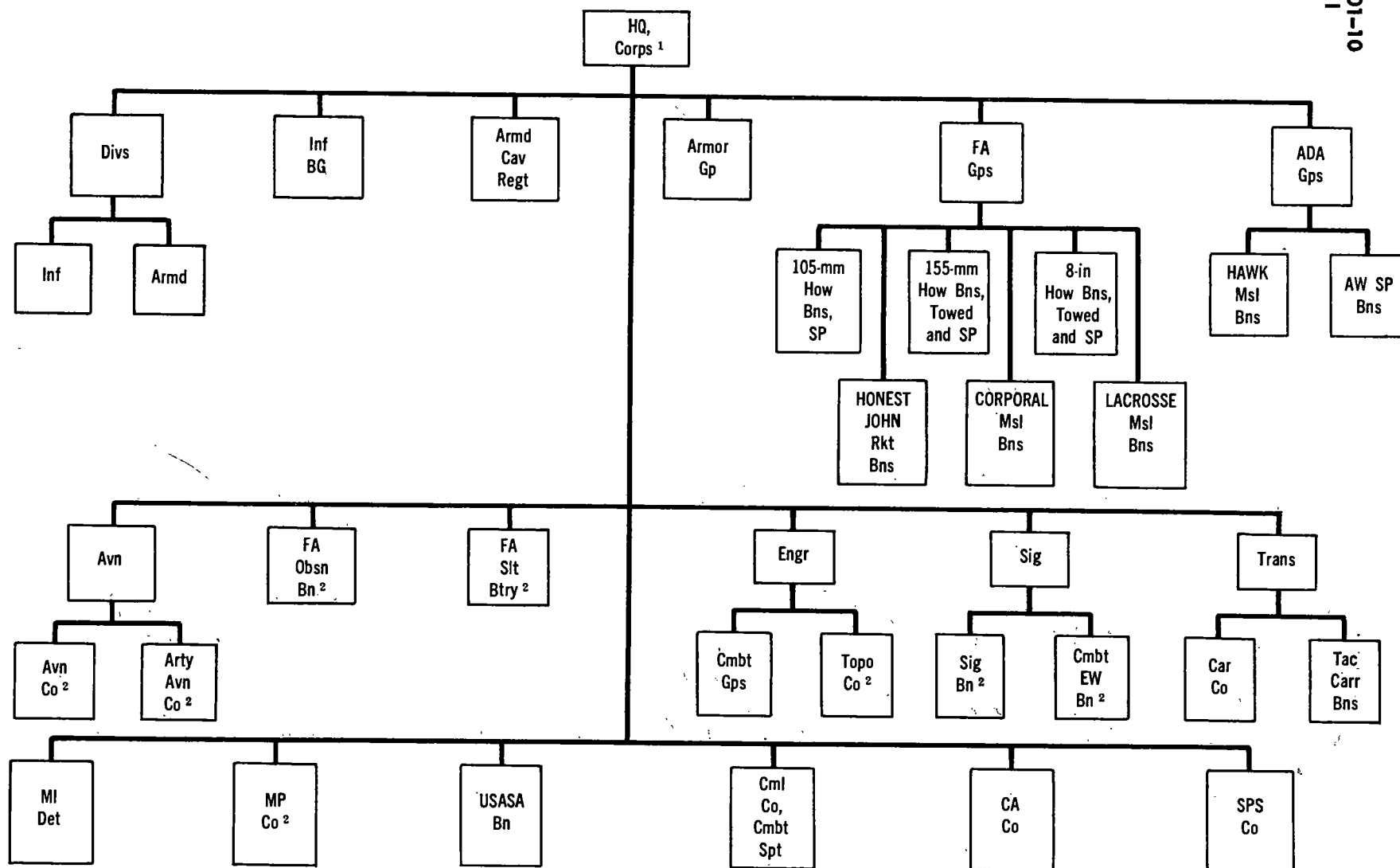
sion. The functions of a corps in a field army are primarily tactical. The functions of a separate corps are both tactical and administrative. For classified organizational data pertaining to the various type units found in a corps, see FM 101-10, part III, chapter 1.

b. Diagram of Corps Headquarters, TOE 52-1C.



¹ Normally established in time of war. May or may not be manned in time of peace.

c. Diagram of a Type Corps Combat and Combat Support Troops.

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PART I
1.6

1.7. Task Force

A task force is a temporary grouping of units under one commander, formed for the purpose of carrying out a specific operation or mission. A task force may be a uni-Service task force or a joint task force. If the task force is a joint task force, it will be composed of assigned or attached elements of the Army, the Navy or the Marine Corps, and the Air Force, or two or more of these Services, which is constituted and so designated by the Secretary of Defense or by the commander of a unified command, a specified command, or an existing joint task force. (See JCS Pub. 2.)

1.8. Logistical Commands

a. General. A logistical command is a highly flexible organization consisting of a headquarters and headquarters element and a balanced force of service units organized to execute a specific administrative or logistical support mission, augmented by tactical units if re-

quired for rear area security. Logistical commands normally operate in the communications zone, but may be assigned or attached to a separate field army or an independent task force for the purpose of providing administrative support thereto.

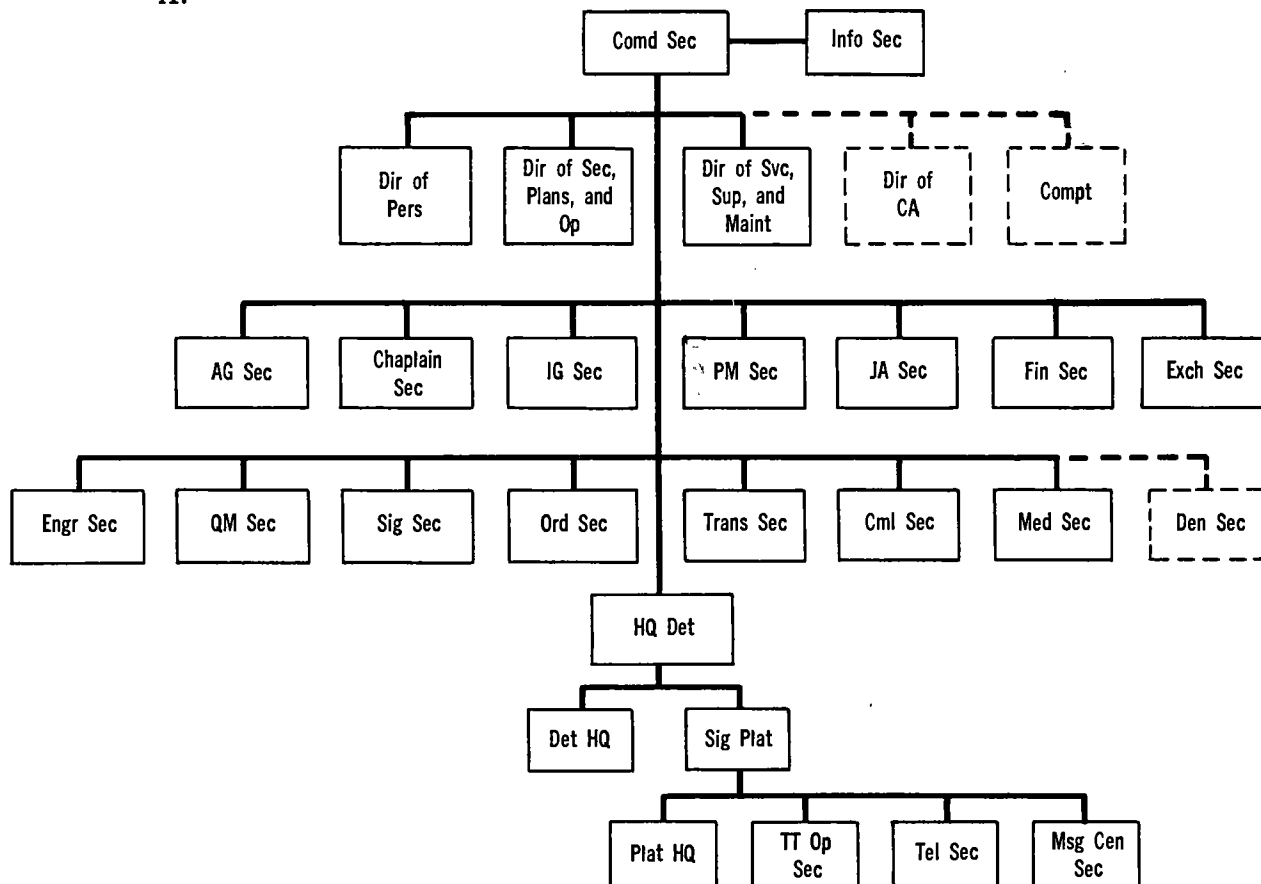
b. Headquarters, Logistical Commands. The organization of these headquarters is flexible and should be tailored to fit the mission assigned. The staff organization is designed to fit the responsibilities of the command.

c. Service Units. Service units of the required numbers and types are assigned or attached as necessary to accomplish the assigned mission.

d. TOE Type Headquarters. At the present time, there are three types of TOE headquarters, logistical command (types A, B, and C). These headquarters are available to provide the nuclei for organizing logistical commands and are designed to command and control service forces as indicated below.

(1) *Logistical command type A (TOE 54-2).*

(a) *Organization chart for headquarters and headquarters detachment, logistical command A.*



(b) *Capabilities.*

1. Provides the organizational structure and a nucleus of a minimum number of trained logisticians and administrative personnel to provide the headquarters, logistical command, for—

- (a) A base logistical command (BALOG).
- (b) An advance logistical command (ADLOG).
- (c) A logistical command in support of a major independent force of one reinforced division.
- (d) Administration and rehabilitation of an area in which civil means are inadequate because

of natural disaster or enemy action.

2. When augmentation of director of civil affairs (Off 1 EM 1), comptroller (Off 1 EM 5), and dental section (Off 1 EM 2) is authorized, the director of civil affairs, comptroller, and dental surgeon provide staff supervision over civil affairs, comptroller activities, and dental activities, respectively.
3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has the capability of defending itself and its in-

stallations against hostile ground attack.

(c) *Strength.*

1. Headquarters and headquarters detachment, logistical command A: Off 59 WO 5 EM 128 Agg 192.

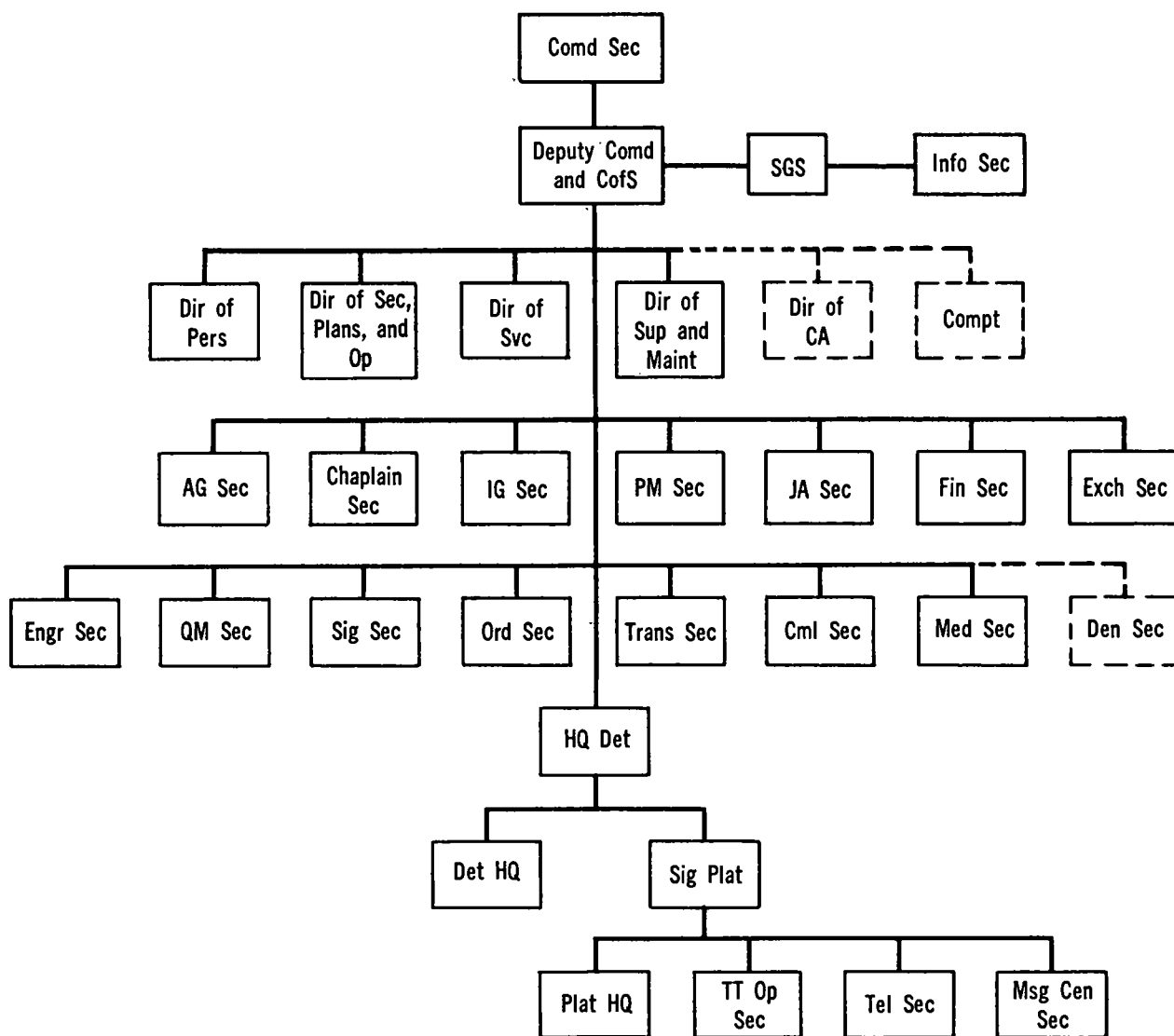
2. Logistical command A: Aggregate 192 plus assigned or attached service forces (9,000 to 15,000).

(d) *Basis of allocation.* As required; normally 1 for the support of a force of approximately 30,000 troops

(e) *Mobility.* Fixed.

(2) *Logistical command type B (TOE 54-102).*

(a) *Organization chart for headquarters and headquarters detachment, logistical command B.*



(b) Capabilities.

1. Provides the organizational structure and a nucleus of a minimum number of trained logisticians and administrative personnel to provide the headquarters, logistical command, for—
 - (a) A base logistical command.
 - (b) An advance logistical command.
 - (c) A logistical command in support of a major independent force of one corps.
 - (d) Administration and rehabilitation of an area in which civil means are inadequate because of natural disaster or enemy action.
2. When augmentation of director of civil affairs (Off 3 EM 2), comptroller (Off 3 WO 1 EM 6), and dental section (Off 1 EM 2) is authorized, the director of civil affairs, comptroller, and den-

tal surgeon provide staff supervision over civil affairs, comptroller activities, and dental activities, respectively.

3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has the capability of defending itself against hostile ground attack.

(c) Strength.

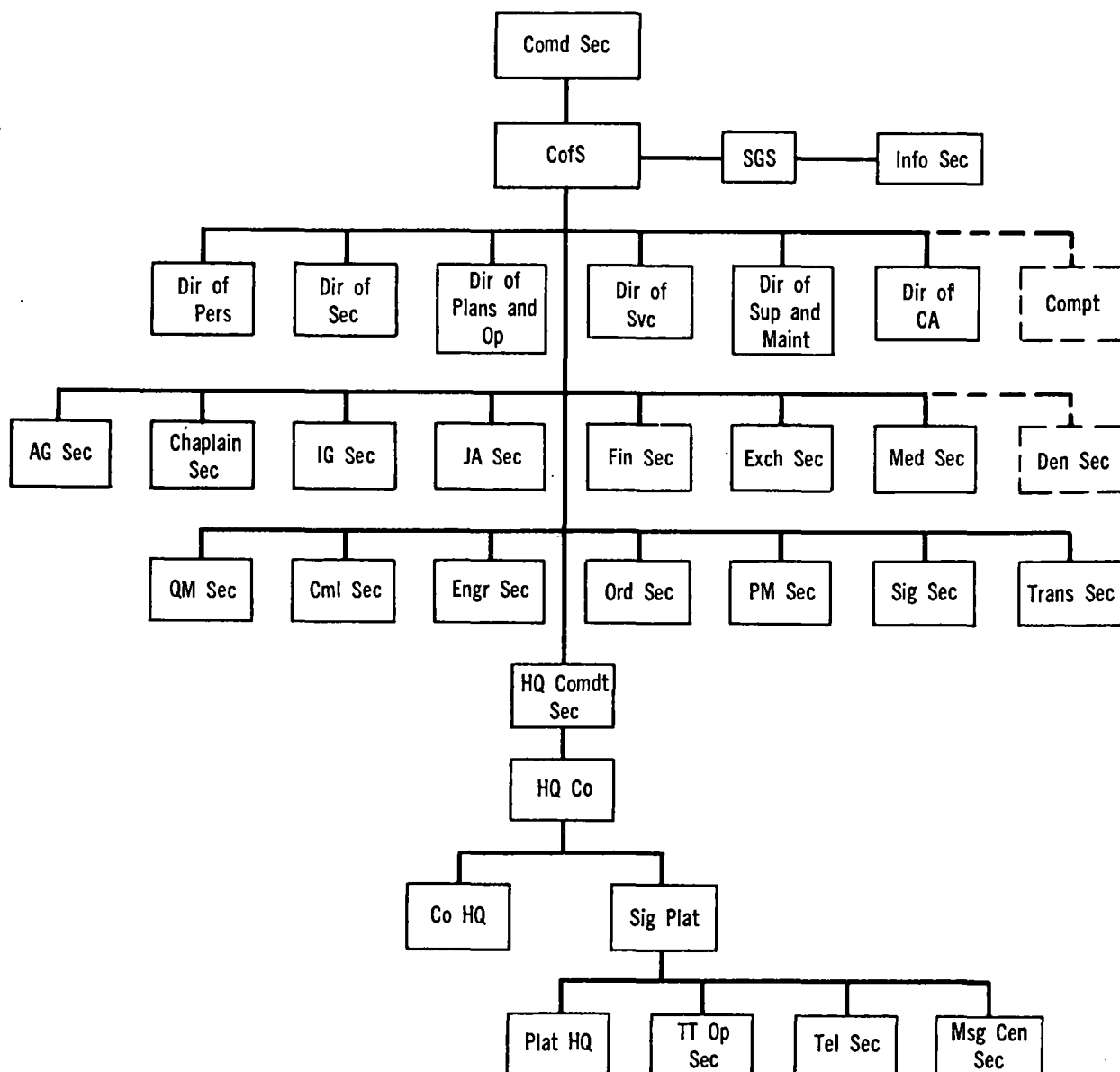
1. Headquarters and headquarters detachment, logistical command B: Off 115 ANC 1 WO 12 EM 200 Agg 328.
2. Logistical command B: Aggregate 328 plus assigned or attached service forces (35,000 to 60,000).

- (d) *Basis of allocation.* As required; normally 1 for the support of a force of approximately 100,000 troops.

- (e) *Mobility.* Fixed.

(3) *Logistical command type C (TOE 54-202).*

(a) *Organization chart for headquarters and headquarters company, logistical command C.*



(b) *Capabilities.*

1. Provides the organizational structure and a nucleus of a minimum number of trained logisticians and administrative personnel to provide the headquarters, logistical command, for—

- (a) Theater army logistical command.
- (b) A base logistical command.
- (c) An advance logistical command.
- (d) A logistical command in support of a major independent force of four or more divisions.

- (e) Administration and rehabilitation of an area in which civil means are inadequate because of natural disaster or enemy action.
- 2. When augmentation of comptroller (Off 4 WO 1 EM 9) and dental section (Off 2 EM 2) is authorized, the comptroller and the dental surgeon will provide supervision over comptroller and dental activities, respectively.
- 3. Individuals of this unit, except chaplain and medical personnel, can fight as infantrymen when required. The unit has the capa-

bility of defending itself against hostile ground attack.

(c) *Strength.*

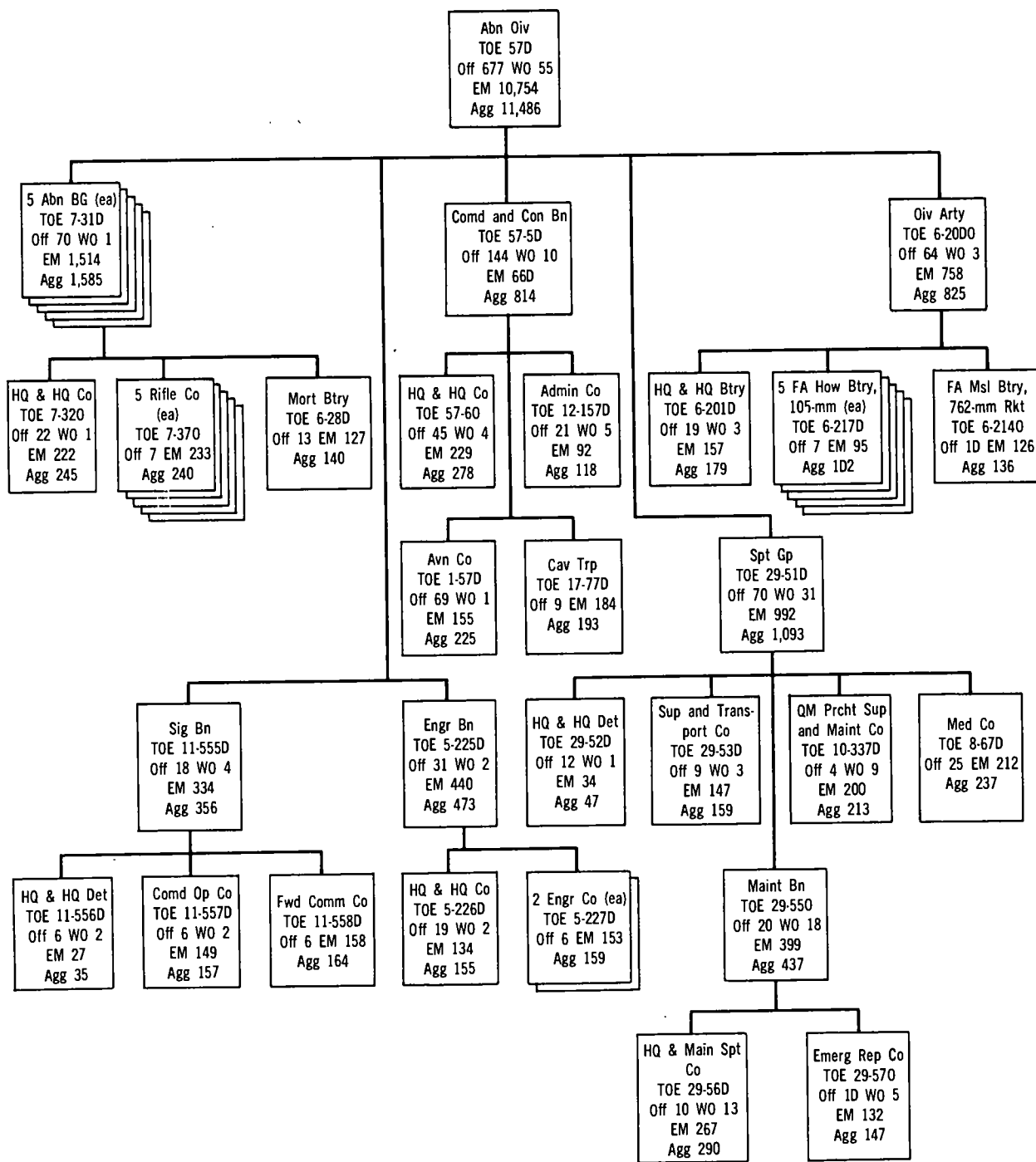
- 1. Headquarters and headquarters company, logistical command C: Off 170 ANC 1 WO 18 EM 319 Agg 508.
- 2. Logistical command C: Aggregate 508 plus assigned or attached service forces (75,000 to 150,000).

(d) *Basis of allocation.* As required; normally one for the theater army logistical command and one for each advance logistical command and each base logistical command.

(e) *Mobility.* Fixed.

Section III. AIRBORNE DIVISION

1.9. Airborne Division—Organization



1.10. Airborne Division—Weapons (TOE 57D)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Weapons	Total abn div (aug) ¹	Comd and con bn					5 abn BG (ea)				Div arty				Engr bn			Sig bn			Spt gp						Sup and trans- port co (aug) ⁸	Med co	
			Total bn (aug)	HQ & HQ co (aug) ²	Admin co (aug) ³	Avn co (aug) ⁴	Cav trp	Total BG (ea)	HQ & HQ co	5 rifle co (ea)	Mor- tar btry	Total div arty (aug)	HQ & HQ btry (aug) ⁵	5 FA how btry, 105- mm (ea)	FA msl btry, 762- mm rkt ⁶	Total bn	HQ & HQ co	2 engr (ea)	Total bn	HQ & HQ det	Comd op co	Fwd comm co	Total gp (aug)	HQ & HQ det	prcht sup and maint co	Maint bn				
																										Total bn (aug)	HQ & main spt co (aug) ⁷			Emerg rep co
2	Gun, mach, cal. .50, Bng, hv bbl, flex.....	4/																	(2)		1	1	(2)/			(2)/	2/			
3	Gun, mach, 7.62-mm, lt-weight, GP.....	438/	(47)/	3/	4/		40	(54)	8	8	6	(37)/	5/	4	12	(30)	12	9	(15)			15	(39)/			(39)/		39		
4	Gun, 90-mm, SP, full-tracked.....	30/						(6)	6																					
5	Howitzer, 105-mm, on carriage.....	25/										(25)/		5																
6	Launcher, grenade.....	765/						(147)	7	28		(30)/	6/	3	9															
7	Launcher, 762-mm rkt, XM33.....	4/										(4)/		4																
8	Launcher, rkt, 3.5-in.....	458/	(11)/	9/			2	(73)	3	11	15	(42)/	9/	5	8	(12)	2	5	(10)	1	3	6	(18)/		1	(9)/	6/	3	8/	
9	Mortar, 81-mm, on mount.....	75/						(15)		3																				
10	Mortar, 105-mm.....	40/						(8)			8																			
11	Pistol, semiauto, cal. .45.....	1,963/20	(129)/(15)	36/2	13/1	69/12	11	(352)	21	66	1	(19)/(5)	13/5	1	1	(11)	9	1	(6)	4	1	1	(38)/	4	1	(10)/	6/	4	3/	20
12	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl.....	644/	(20)/				20	(120)		24						(24)		12												
13	Rifle, semiauto, 7.62-mm, lt bbl.....	8,865/70	(663)/(48)	242/4	103/26	156/18	162	(1,111)	222	150	139	(805)/	165/	101	135	(438)	146	146	(350)	31	156	163	(1,054)/(22)	42	212	(427)/(13)	284/13	143	156/9	217
14	Rifle, 106-mm, on mount.....	55/	(5)/				5	(10)		2																				
15	Individual weapons.....	11,472/90	(812)/(63)	278/6	116/27	225/30	193	(1,583)	243	240	140	(824)/(5)	178/5	102	136	(473)	155	159	(356)	35	157	164	(1,092)/(22)	46	213	(437)/(13)	290/13	147	159/9	237
16	Crew-served weapons.....	1,894/	(63)/	12/	4/		47	(313)	24	52	29	(138)/	20/	17	33	(42)	14	14	(27)	1	4	22	(59)/		1	(50)/	8/	42	8/	
17	Total weapons.....	13,366/90	(875)/(63)	290/6	120/27	225/30	240	(1,896)	267	292	169	(962)/(5)	198/5	119	169	(515)	169	173	(383)	36	161	186	(1,151)/(22)	46	214	(487)/(13)	298/13	189	167/9	237

¹ When a divider (/) is used in columns 2-6, 12, 13, 23, 26, 27, and 29, figures left of the divider give full-strength weapons data, while figures to the right pertain to aug data.

² Includes civil affairs section aug.

³ Includes replacement det aug.

⁴ Includes lt cargo helicopter mechanic and aviator aug.

⁵ Includes air observer aug.

⁶ Msl btry aug (when the btry is issued the truck-mounted 762-mm rkt system as additional equipment) are not included.

⁷ Includes aircraft maint section aug.

⁸ Includes graves registration section aug.

Includes wartime aug of 9 str.

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1.16. Infantry Division—Weapons (TOE 7D)

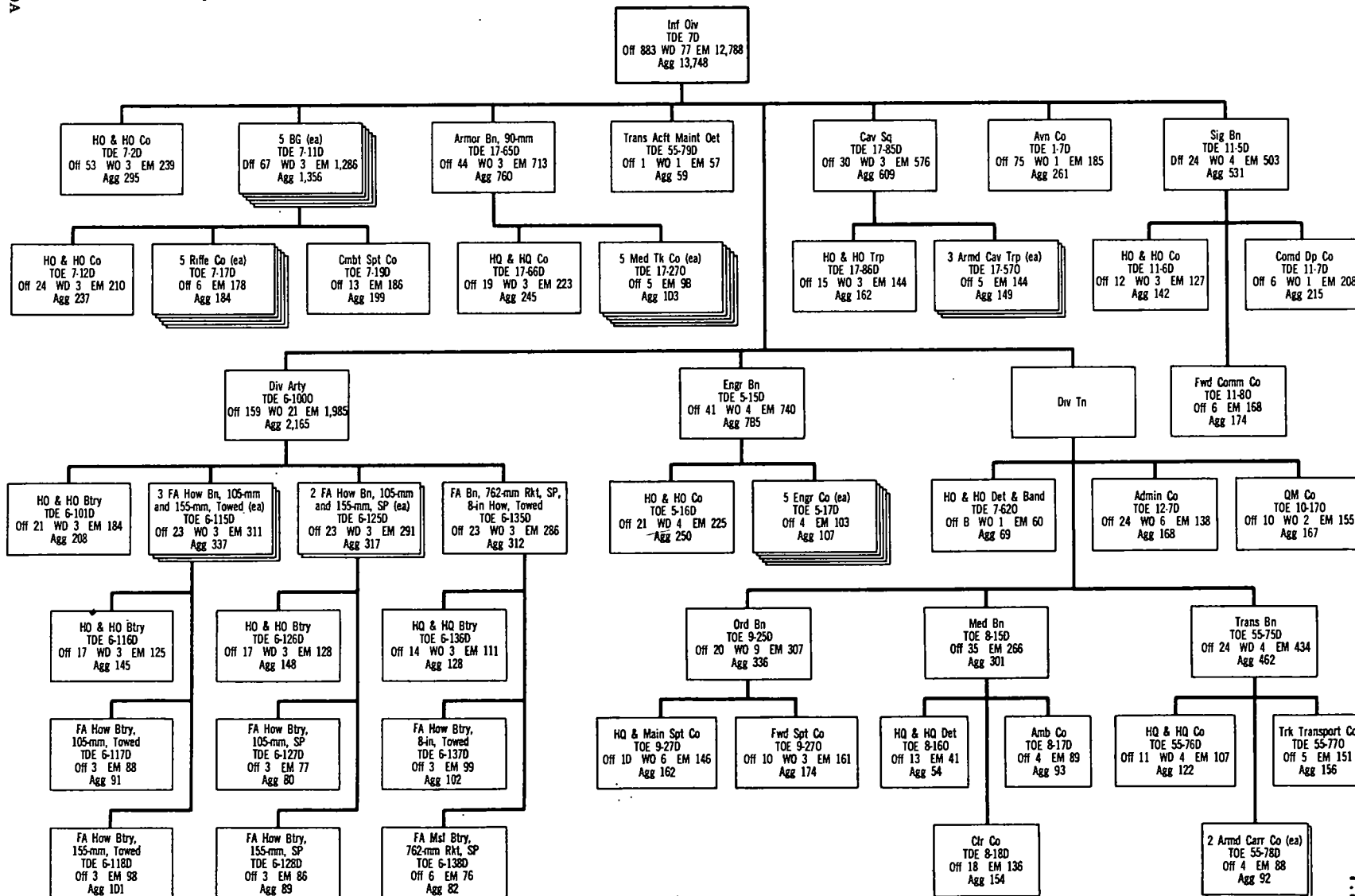
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	Weapons	Total inf div	HQ & HQ co	Avn co	Trans acft maint det	5 BG (ea)				Armor bn, 90-mm			Cav sq			Engr bn			Sig bn				Div arty												Div tn																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
						Total BG	HQ & HQ co	5 rifle co (ea)	Combt apt co	Total bn	HQ & HQ co	5 med tk co (ea)	Total sq	HQ & HQ trp	3 armd cav trp (ea)	Total bn	HQ & HQ co	5 engr co (ea)	Total bn	HQ & HQ btry	Comd op co	Fwd comm co	Total div arty	HQ & HQ btry	3 FA how bn, 105-mm and 155-mm, towed (ea)				2 FA how bn, 105-mm and 155-mm, SP (ea)				FA bn, 762-mm rkt, SP, 8-in how, towed				HQ & HQ det & band	QM co	Admin co	Med bn				Ord bn			Trans bn																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

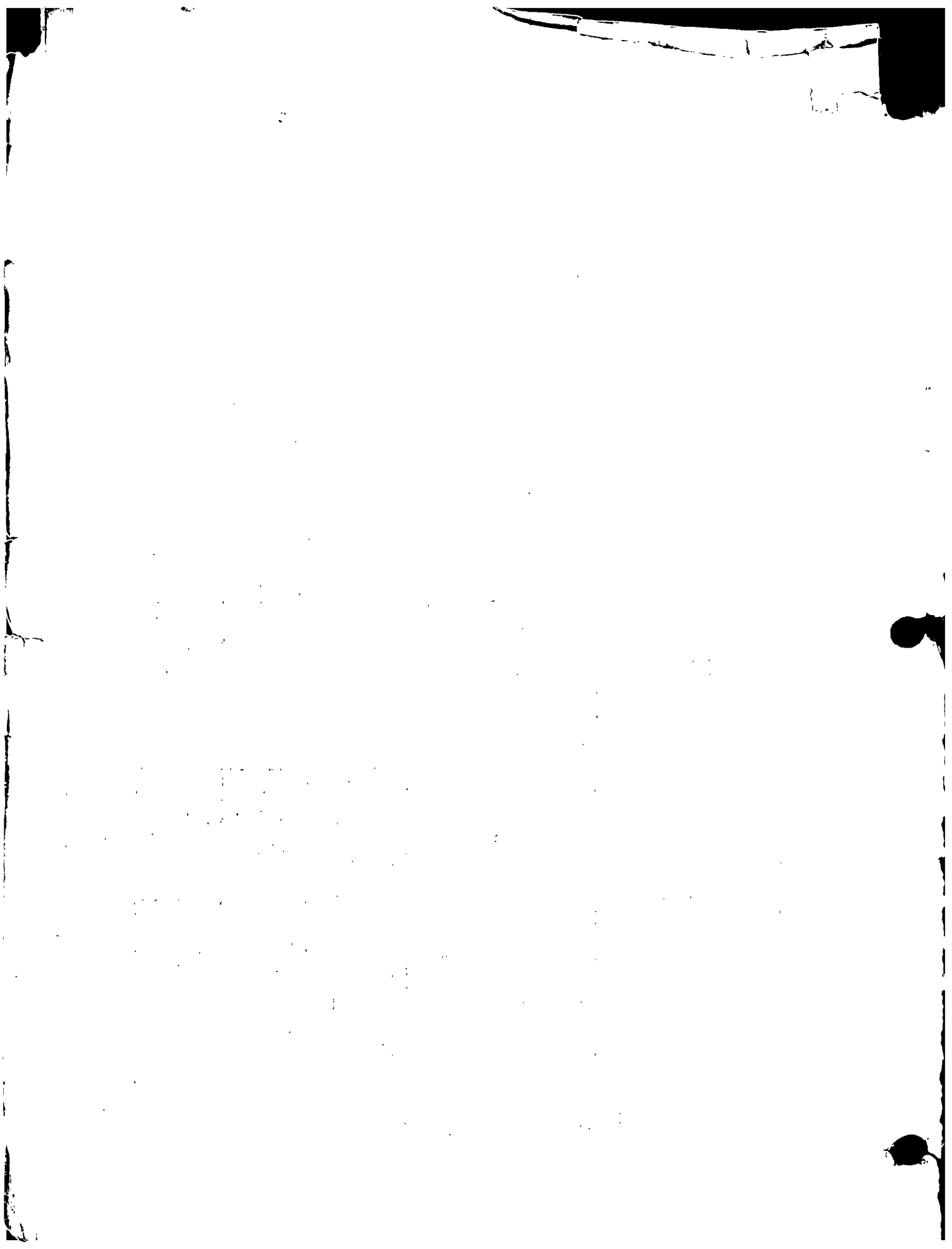
¹ Substitute cal .30 MG for 7.62-mm MG when appropriate.



Section V. INFANTRY DIVISION

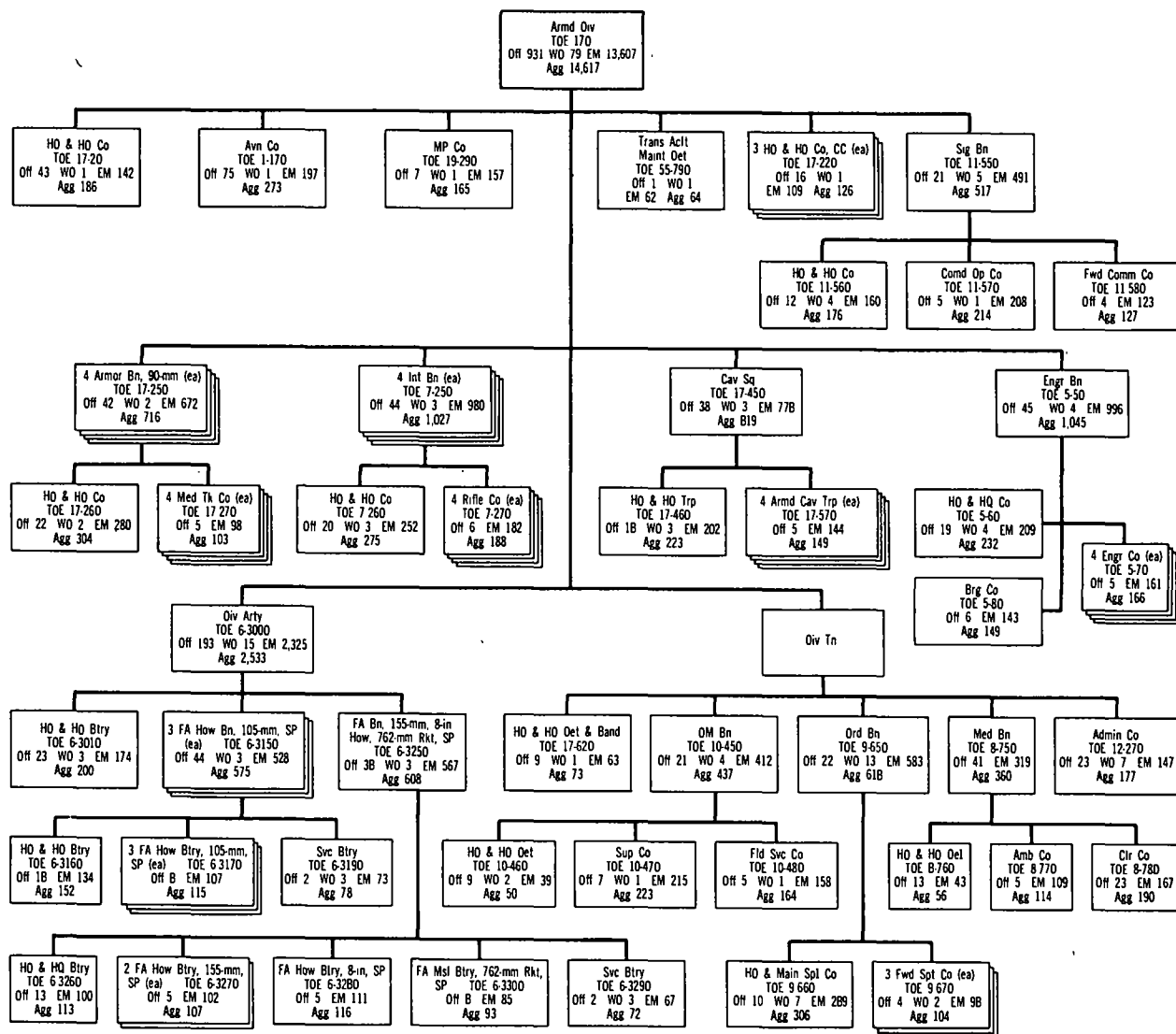
1.15. Infantry Division—Organization





Section IV. ARMORED DIVISION

1.12. Armored Division—Organization



1.11. Airborne Division—Vehicles and Major Vehicular Equipment (TOE 57D)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Item	Total abn div (aug) ¹	Comd and con bn					5 abn BG (ea)				Div arty				Eng bn			Sig bn				Spt gp							
			Total bn (aug)	HQ & HQ co (aug) ²	Admin co (aug) ²	Avn co	Cav trp	Total BG (ea)	HQ & HQ co	5 rifle co (ea)	Mor- tar btry	Total div arty	HQ & HQ btry	5 FA how btry, 105- mm (ea)	FA msl btry, 762- mm rkt ⁴	Total bn	HQ & HQ co	2 engr co (ea)	Total bn	HQ & HQ det	Comd op co	Fwd comm co	Total gp (aug)	HQ & HQ det	QM precit sup and maint co	Maint bn			Sup and trans- port co (aug)	Med co
																										Total bn	HQ & main spt co	Emerg rep co		
AIRCRAFT																														
2	Airplane, obsn, lt.....	10/	(10)/			10																								
3	Airplane, util.....	4/	(4)/			4																								
4	Helicopter, obsn.....	18/	(18)/			18																								
5	Helicopter, util.....	20/	(20)/			20																								
6	Total aircraft.....	52/	(52)/			52																								
TRACKED VEHICLES																														
7	Tractor, full-tracked, low-speed, diesel-driven, 12,100-17,000-lb DBP, air-transportable.....	6/														(6)	6													
8	Vehicle, full-tracked, 90-mm gun, SP, M56.....	30/						(6)	6																					
9	Total tracked vehicles.....	36/						(6)	6							(6)	6													
WHEELED VEHICLES																														
10	Carrier, lt wpn, inf, ¼-ton, 4x4.....	475/	(1)/	1/				(87)	4	12	23					(25)	1	12	(5)		5		(9)/			(5)	4	1	4/	
	Shop equipment, contact maint, trk-mtd.....	2/																					(2)/			(2)		2		
12	Signal Corps repair shop, trk-mtd, 2½-ton, 6x6.....	1/																					(1)/			(1)	1			
13	Trk, amb, frontline, ¼-ton, 4x4.....	1/																												
14	Trk, util, ¼-ton, 4x4.....	451/4	(110)/(3)	28/2	9/1	11	62	(39)	28	1	6	(68)	20	7	13	(20)	10	5	(12)	1	5	6	(46)/(1)	7	3	(22)	9	13	4/1	10
15	Trk, ¾-ton, 6x6, XM408.....	349/1	(24)/	8/		14	2	(20)	15		5	(97)	17	11	25	(23)	5	9	(52)	4	28	20	(53)/(1)	1	2	(32)		32	4/1	14
16	Trk, ¾-ton, 6x6, XM408, W litter kit.....	62/	(1)/	1/				(6)	6			(1)	1									(30)/								30
17	Trk, ego, ¾-ton, 4x4.....	10/																				(10)/							10/	
18	Trk, wkr, ¾-ton, 6x6, XM408.....	9/																				(9)/			(9)	2	7			
19	Trk, ego, 2½-ton, 6x6, LWB.....	87/1	(10)/(1)	2/	3/1	4	1	(4)	4			(7)	1	1	1	(4)	2	1	(2)		1	1	(44)/	1	4	(10)	9	1	27/	2
20	Trk, ego, 2½-ton, 6x6, LWB, WWN.....	27/1	/(1)		/1			(3)	3			(6)	6									(6)/		1				4/		1
21	Trk, ego, 2½-ton, 6x6, XLWB.....	4/										(4)			4															
22	Trk, dump, 2½-ton, 6x6.....	12/														(12)	8	2												
23	Trk, lt wkr, 2½-ton, 6x6, WWN.....	1/																				(1)/			(1)	1				
24	Trk, shop van, 2½-ton, 6x6.....	3/	(2)/			2																	(1)/			(1)	1			
25	Trk, shop van, 2½-ton, 6x6, WWN.....	1/																				(1)/			(1)	1				
26	Trk, tk, gas, 2½-ton, 6x6.....	4/	(4)/			4																								
27	Trk, med wkr, 5-ton, 6x6, WWN.....	1/																												
28	Total wheeled vehicles.....	1,500/7	(152)/(5)	40/2	12/3	35	65	(159)	60	13	34	(183)	45	19	43	(85)	27	29	(71)	5	39	27	(1)/	9	10	(85)	1	56	53/2	57
TRAILERS																														
29	Battery charger, W 5-kw genr, tlr-mtd, PP-775/U.....	2/										(2)			2															
30	Genr set assembly, gas eng, tlr-mtd, PU-322/G.....	8/																	(8)		3	5								
31	Genr set, gas eng, tlr-mtd, PU-290/MR.....	1/	(1)/			1																								
32	Genr set, gas eng, tlr-mtd, PU-294/G.....	1/	(1)/			1																								
33	Handling unit, 762-mm rkt, tlr-mtd.....	4/										(4)			4															
34	Launcher, 762-mm rkt, XM33.....	4/										(4)			4															
35	Pneumatic tool and compressor outfit, 210 CFM, tlr-mtd.....	3/																												
36	Tlr, amph, ego, ¼-ton, 2-wheel.....	247/ 2	(41)/(1)	16/	9/1	9	7	(20)	15		5	(40)	7	5	8	(19)	9	5	(6)		1	5	(41)/(1)	7	3	(17)	9	8	4/1	10
37	Tlr, ego, ¾-ton, 2-wheel.....	156/1	(20)/	5/		13	2	(6)	3		3	(43)	13	4	10	(1)	1		(18)	2	16		(44)/(1)	1	2	(23)		23	4/1	14
38	Tlr, ego, 1½-ton, 2-wheel.....	76/1	(7)/(1)	1/	2/1	4		(5)	5			(6)	6			(6)	4	1				(32)/		4	(8)	8		20/		
39	Tlr, tk, water, 1½-ton, 2-wheel.....	34/1	(4)/(1)	1/	1/1	1	1	(2)	2			(7)	1	1	1	(3)	1	1	(2)		1	1	(8)/	1	1	(2)	1	1	1/	3
40	Tlr, util, 2½-ton, 2-wheel.....	3/														(3)	3													
41	Tlr, platform, whs, wood, 6,000-lb, pneumatic tires, 48x108-in.....	30/																					(30)/		24				6/	
42	Tlr, rkt, 4-wheel, XM465.....	4/										(4)			4															
43	Water purification equipment set, tlr-mtd, dia- tomite filter, 600 GPH.....	4/														(4)	4													
44	Total tlr.....	577/5	(74)/(3)	23/	12/3	29	10	(33)	25		8	(110)	27	10	33	(39)	23	8	(34)	2	21	11	(155)/(2)	9	34	(50)	18	32	35/2	27
MAJOR VEHICULAR EQUIPMENT																														
45	Crane-shovel, power unit, abn, 7½-ton, ½ cu yd.....	2/														(2)	2													
46	Grader, road, mtz, diesel-driven, 8,975-lb pres- sure at blade, 10-ft blade.....	6/														(6)	6													
47	Loader, scoop-type, diesel-driven, 4-wheel, 1½ cu yd.....	6/														(6)	6													
48	Tractor, wheeled, whs, gas, pneumatic tires, 4,000-lb.....	3/																					(3)/		2				1	
49	Trk, lift, fork, gas, 6,000-lb, pneumatic tires, rough terrain.....	7/																					(7)/		4				3	
50	Trk, lift, fork, gas, 15,000-lb, pneumatic tires, 210-in. lift.....	2/																					(2)/		2					

¹ When a divider (/) is used in columns 2-5, 23, and 29, figures left of the divider give full-strength vehicular data, while figures to the right pertain to aug data.

² Includes civil affairs section aug.

³ Includes repl det aug.

⁴ Msl btry aug (when the btry is issued the trk-mtd 762-mm rkt system as additional equipment) are not included.

Section VI. ENGINEER AMPHIBIOUS SUPPORT COMMAND

1.18. General

a. The engineer amphibious support command is designed to provide specially qualified personnel and units for performance of combat and interim administrative support functions as part of an Army force executing assault landing operations in hostile territory. It is typically employed in joint or unilateral operations involving water crossings, to include—

- (1) Amphibious operations.
- (2) Shore-to-shore operations.
- (3) River-crossing operations.

b. Capabilities of the engineer amphibious support command include the following:

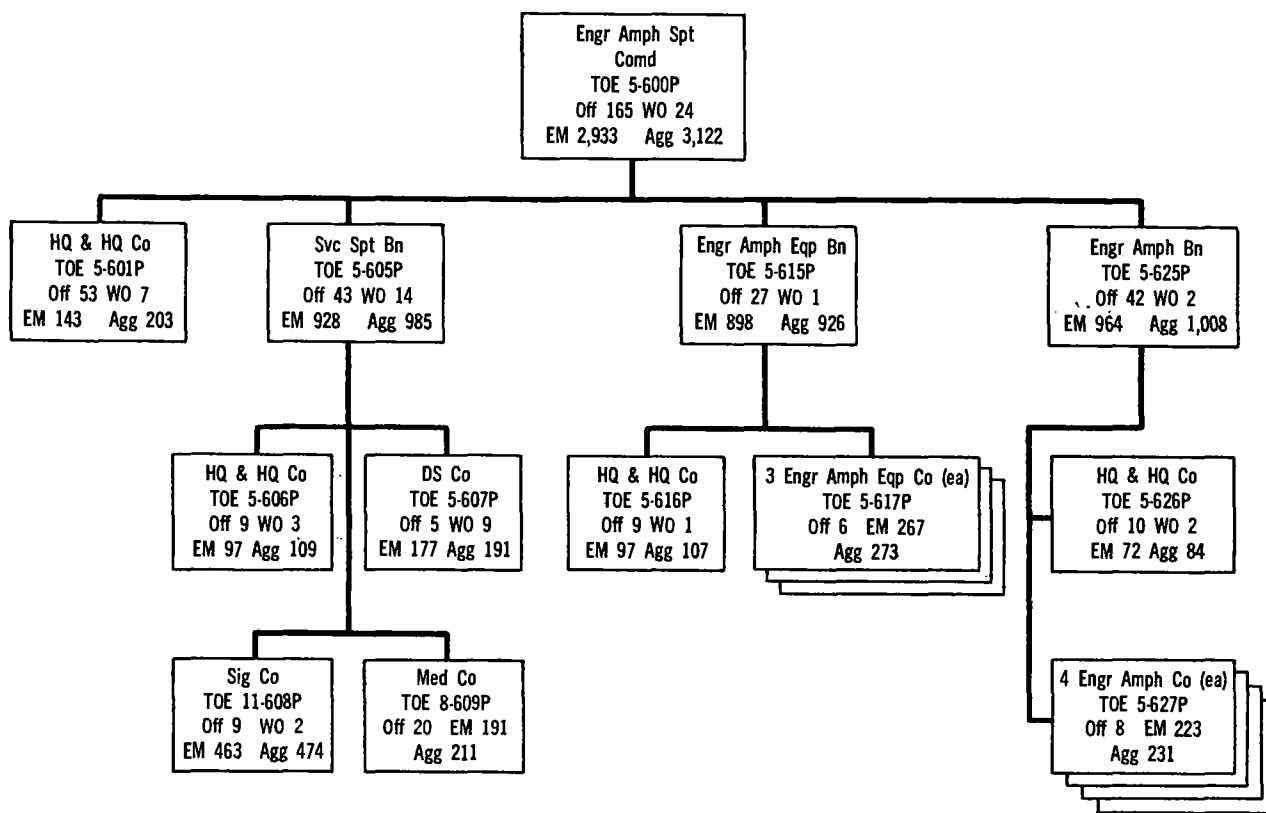
- (1) The engineer amphibious support command commander and his subordinate unit commanders serve as special staff assistants to the Army force commanders during planning.
- (2) The engineer amphibious support command is capable of furnishing the command element and specialized shore party units as nuclei for 4 shore parties at division level and 12 shore parties at battle group landing team or comparable level. The engineer amphibious support command headquarters functions as the shore party

headquarters at the landing force echelon above division level; i.e., corps or field army, depending on the composition of the Army landing force.

- (3) One battalion equipped with amphibians is organic to the engineer amphibious support command. The amphibians are used in ship-to-shore movements in amphibious operations and in shore-to-shore operations and river-crossings. The amphibians provide mobility and armor protection to landing teams until such time as tactical carriers and organic vehicles are available ashore. The battalion is capable of providing lift for the dismounted combat elements of three reinforced battle groups. The use of amphibians makes possible rapid, continuous movement to relatively deep initial objectives. The amphibians may also be used to deliver critical supplies directly to users inland from the shore.

c. The following data are based on advance TOE plans and represent the best data currently available. These data should be used for preliminary planning estimates only and for instructional purposes at service schools.

1.19. Engineer Amphibious Support Command



1-100

1.20. Engineer Amphibious Support Command—Weapons

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Item	Total engr amph spt comd	HQ & HQ co, engr amph spt comd	Svc spt bn					Engr amph eqp bn			Engr amph bn		
				Total bn	HQ & HQ co	DS co	Sig co	Med co	Total bn	HQ & HQ co	3 engr amph eqp co (ea)	Total bn	HQ & HQ co	4 engr amph co (ea)
2	Gun, mach, cal .50, Bng, hv bbl, flex ..	55	2	(27)	4	11	12	-----	(5)	2	1	(21)	1	5
3	Gun, mach, 7.62-mm, lt-weight, GP ..	74	-----	(26)	-----	2	24	-----	-----	-----	-----	(48)	-----	12
4	Gun, tk, 90-mm ..	24	-----	-----	-----	-----	-----	-----	-----	-----	-----	(24)	-----	6
5	Launcher, rkt, 3.5-in ..	71	2	(8)	4	4	-----	-----	(26)	5	7	(35)	3	8
6	Pistol, semiauto, cal .45 ..	957	43	(29)	3	-----	6	20	(745)	37	236	(140)	4	34
7	Rifle, semiauto, 7.62-mm, lt bbl ..	2,162	156	(957)	106	192	468	191	(181)	70	37	(868)	80	197
8	Individual weapons ..	3,119	199	(986)	109	192	474	211	(926)	107	273	(1,008)	84	231
9	Crew-served weapons ..	224	4	(61)	8	17	36	-----	(31)	7	8	(128)	4	31
10	Total weapons ..	3,343	203	(1,047)	117	209	510	211	(957)	114	281	(1,136)	88	262

26 1.21. Engineer Amphibious Support Command—Vehicles and Major Operational Equipment

1		2	3	4	5	6	7	8	9	10	11	12	13	14
1	Item	Total engr amph spt comd	HQ & HQ co, engr amph spt comd	Svc spt bn					Engr amph eqp bn			Engr amph bn		
				Total bn	HQ & HQ co	DS co	Sig co	Med co	Total bn	HQ & HQ co	3 engr amph eqp co (ea)	Total bn	HQ & HQ co	4 engr amph co (ea)
AIRCRAFT														
2	Airplane, obsn, lt.....	1	1											
3	Helicopter, obsn.....	4	4											
4	Total aircraft.....	5	5											
TRACKED VEHICLES														
5	Landing vehicle, tracked.....	218							(218)	11	69			
6	Tk, cmbt, full-tracked, med gun, W bulldozer.....	24										(24)		6
7	Tractor, full-tracked, low-speed, diesel-driven, 24,100-32,000-lb DBP, W bulldozer, tilting, cable-op.....	15		(3)		3						(12)		3
8	Total tracked vehicles.....	257		(3)		3			(218)	11	69	(36)		9
WHEELED VEHICLES														
9	Automobile, sedan, lt.....	1	1											
10	Compressor, reciprocating, power-driven, trk-mtd, air or liquid cooled, 210 CFM.....	13										(13)	1	3
11	Landing vehicle, wheeled, 2½-ton, 6x6.....	12										(12)		3
12	Shop equipment, contact maint, trk-mtd, set No. 3.....	5		(5)		5								
13	Shop equipment, emerg rep, trk-mtd.....	1										(1)	1	
14	Shop equipment, org rep, lt, trk-mtd, set No. 2.....	1										(1)	.1	
15	Shop equipment, welding, trk-mtd, set No. 8.....	2		(2)		2								
16	Signal Corps repair shop, trk-mtd, 2½-ton, 6x6.....	4		(4)			4							
17	Trk, util, ¼-ton, 4x4.....	193	29	(63)	6	15	40	2	(12)	9	1	(89)	9	20
18	Trk, amb, fld, ¾-ton, 4x4.....	24		(24)				24						
19	Trk, cgo, ¾-ton, 4x4.....	21		(14)	3	6	4	1	(5)	2	1	(2)	2	
20	Trk, cgo, ¾-ton, 4x4, WWN.....	144	7	(128)	2		126		(1)	1		(8)	4	1
21	Trk, cgo, 2½-ton, 6x6, LWB.....	39		(20)	6		2	12	(16)	7	3	(3)	3	
22	Trk, cgo, 2½-ton, 6x6, LWB, WWN.....	90	20	(41)	3	17	17	4	(6)	3	1	(23)	3	5
23	Trk, shop van, 2½-ton, 6x6.....	4	1	(3)		3								
24	Trk, tk, gas, 2½-ton, 6x6, WWN.....	1	1											
25	Trk, dump, 5-ton, 6x6.....	22		(10)		10						(12)		3
26	Trk, dump, 5-ton, 6x6, WWN.....	38										(38)	2	9
27	Trk, med wkr, 5-ton, 6x6 WWN.....	7	1	(4)	1	3			(1)	1		(1)	1	
28	Trk, tractor, 5-ton, 6x6, SWB, WWN.....	29		(4)		4						(25)	1	6
29	Trk, tractor, 10-ton, 6x6, WWN.....	8		(8)		8								
30	Total wheeled vehicles.....	659	60	(330)	21	73	193	43	(41)	23	6	(228)	28	50

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Item	Total engr amph spt comd	HQ & HQ co, engr amph spt comd	Svc spt bn					Engr amph eqp bn			Engr amph bn		
				Total bn	HQ & HQ co	DS co	Sig co	Med co	Total bn	HQ & HQ co	3 engr amph eqp co (ea)	Total bn	HQ & HQ co	4 engr amph co (ea)
	TRAILERS													
31	Dolly tlr converter, 18-ton, 4-wheel.....	8		(8)		8								
32	Generator set, gas eng, tlr-mtd, PU-290/MR.....	4		(4)			4							
33	Lubricating and servicing unit, power-op, tlr-mtd, 12 CFM, air compressor, gas eng, W starter genr, operable to -65°F., winterized.....	2		(1)		1						(1)	1	
34	Stlr, ego van, 6-ton, 2-wheel.....	2		(2)		2								
35	Stlr, low-bed, 25-ton, 4-wheel.....	33		(8)		8						(25)	1	6
36	Shop equipment, elec rep, stlr-mtd, set No. 4.....	1		(1)		1								
37	Shop equipment, GP, hv, stlr-mtd, set No. 1.....	1		(1)		1								
38	Tlr, amph, ego, ¼-ton, 2-wheel.....	189	29	(61)	6	13	40	2	(10)	7	1	(89)	9	20
39	Tlr, ego, ¾-ton, 2-wheel.....	118	7	(99)	5	12	82		(4)	1	1	(8)	4	1
40	Tlr, ego, 1½-ton, 2-wheel.....	119	16	(34)	7	8	4	15	(12)	6	2	(57)	5	13
41	Tlr, tk, water, 1½-ton, 2-wheel.....	17	2	(6)	1	2	2	1	(4)	1	1	(5)	1	1
42	Tlr, flat-bed, 10-ton.....	12										(12)		3
43	Welding shop, ego, DC, ARC, 300-amp output, tlr-mtd.....	7	1	(1)	1				(4)	1	1	(1)	1	
44	Total tlr.....	513	55	(226)	20	56	132	18	(34)	16	6	(198)	22	44
	MAJOR OPERATIONAL EQUIPMENT													
45	Boat, picket, diesel, steel, 46-ft 4½-in.....	4							(4)	1	1			
46	Bulldozer, earth-moving, tk mounting.....	24										(24)		6
47	Bulldozer, earth-moving, tilting, cable-op, tractor mounting, 24,100-32,000-lb DBP.....	3		(3)		3								
48	Crane-shovel, basic unit, crawler-mtd, 10 through 14¾-ton, 35-ft boom, ¾-cu yd shovel, gas eng.....	13										(13)	1	3
49	Crane, tractor mounting, cen mounting, 12,000-lb cap, 30-ft long, not folding or telescopic boom for tractor, full-tracked, low-speed.....	1		(1)		1								
50	Crane, tractor, towed, 20-ton.....	2		(2)		2								
51	Grader, road, mtz, diesel power unit, 12,500-14,475-lb pressure at blade, 12-ft long blade.....	12										(12)		3
52	LCM MK VI.....	4		(4)		4								
53	Water purification equipment set.....	5		(3)	3				(1)	1		(1)	1	

Section VII. U.S. ARMY MISSILE COMMANDS

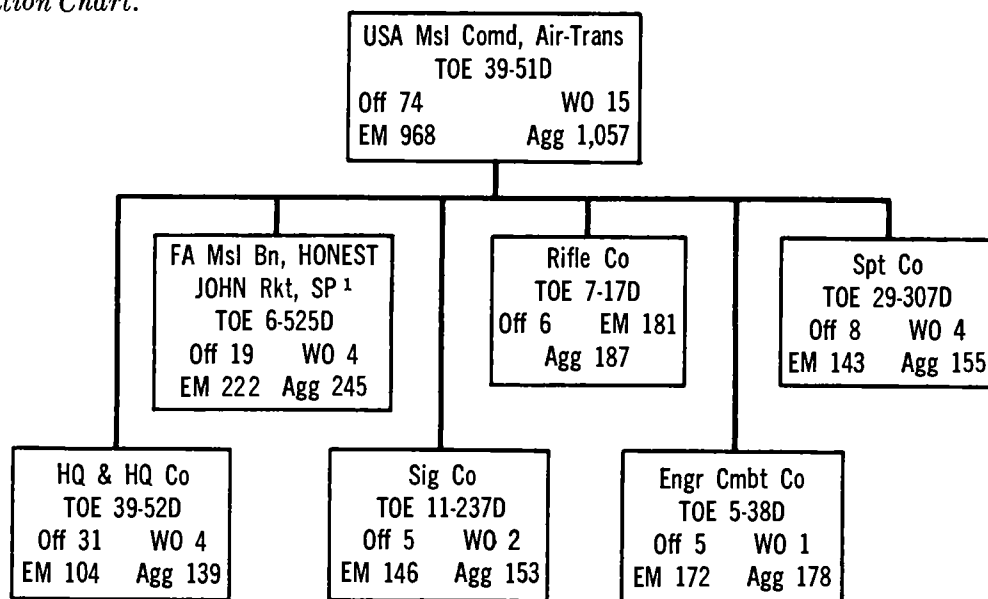
1.22. General

The U.S. Army missile commands are organized as tactical units to provide nuclear fire support to U.S. or Allied ground forces in any area of the world with minimum warning. Missile commands embrace three different types (air-transportable, medium, and heavy), and

deployment is determined by the nature of the mission. The U.S. Army missile commands are assigned to theaters of operation and may be allocated as required. The data for the medium and heavy missile commands contained in this section are based on tentative TOE and should be used only for planning purposes and service school instruction.

1.23. U.S. Army Missile Command, Air-Transportable, TOE 39-51D

a. Organization Chart.



¹ Includes electronic meteorological section augmentation.

b. U.S. Army Missile Command, Air-Transportable—Capabilities.

- (1) Supports, by nuclear fire, counter-aggression forces or reinforces indigenous forces in localized hostilities.
- (2) Is air-transportable.
- (3) Acquires and develops target data.
- (4) Supports itself logistically after resupply has been delivered to the missile command.
- (5) Is responsible for organizational maintenance. It requires attachment of, or support by, engineer, ordnance, and transportation (aircraft) units for third echelon maintenance.

- (6) Provides limited evacuation and medical care.
- (7) Provides radiation detection and decontamination.
- (8) Is organized as a tactical and administrative unit and is self-sustaining when operating in the vicinity of U.S. forces. When it operates in support of Allied forces isolated from U.S. facilities, the attachment of technical and logistical support cellular detachments may be required. This also includes a requirement for the establishment of a special logistical linkage between port and/or airhead facilities and the

missile command.

- (9) Must be provided air defense protection by supported forces or by attached air defense units.

- (10) Survey control must be provided the HONEST JOHN battalion and target

acquisition platoon elements by the supporting engineer company or by attachment of an engineer survey team of the TOE 5-500 type.

- (11) Is dependent upon outside agencies for assistance in evacuation and medical care.

c. U.S. Army Missile Command, Air-Transportable—Weapons.

	1	2	3	4	5	6	7	8
	Weapons	Total msl comd	HQ & HQ co	FA msl bn, HONEST JOHN rkt, SP (aug) ¹	Sig co	Rifle co	Spt co	Engr cmbt co
1								
2	Gun, mach, cal .50, Bng, hv bbl, flex.....	18			3		11	4
3	Gun, mach, 7.62-mm, lt-weight, GP.....	29		16	1	6		6
4	Launcher, 762-mm rkt, trk-mtd.....	4		4				
5	Launcher, rkt, 3.5-in.....	37		13	3	7	5	9
6	Mortar, 81-mm, on mount.....	3				3		
7	Pistol, semiauto, cal .45.....	60	18	5	5	29	2	1
8	Rifle, semiauto, 7.62-mm, lt bbl.....	983	119	240	148	158	141	177
9	Rifle, 106-mm, on mount.....	2				2		
10	Individual weapons.....	1,043	137	245	153	187	143	178
11	Crew-served weapons.....	93		33	7	18	16	19
12	Total weapons.....	1,136	137	278	160	205	159	197

¹ Includes electronic meteorological section augmentation.

d. U.S. Army Missile Command, Air-Transportable—Vehicles and Major Vehicular Equipment.

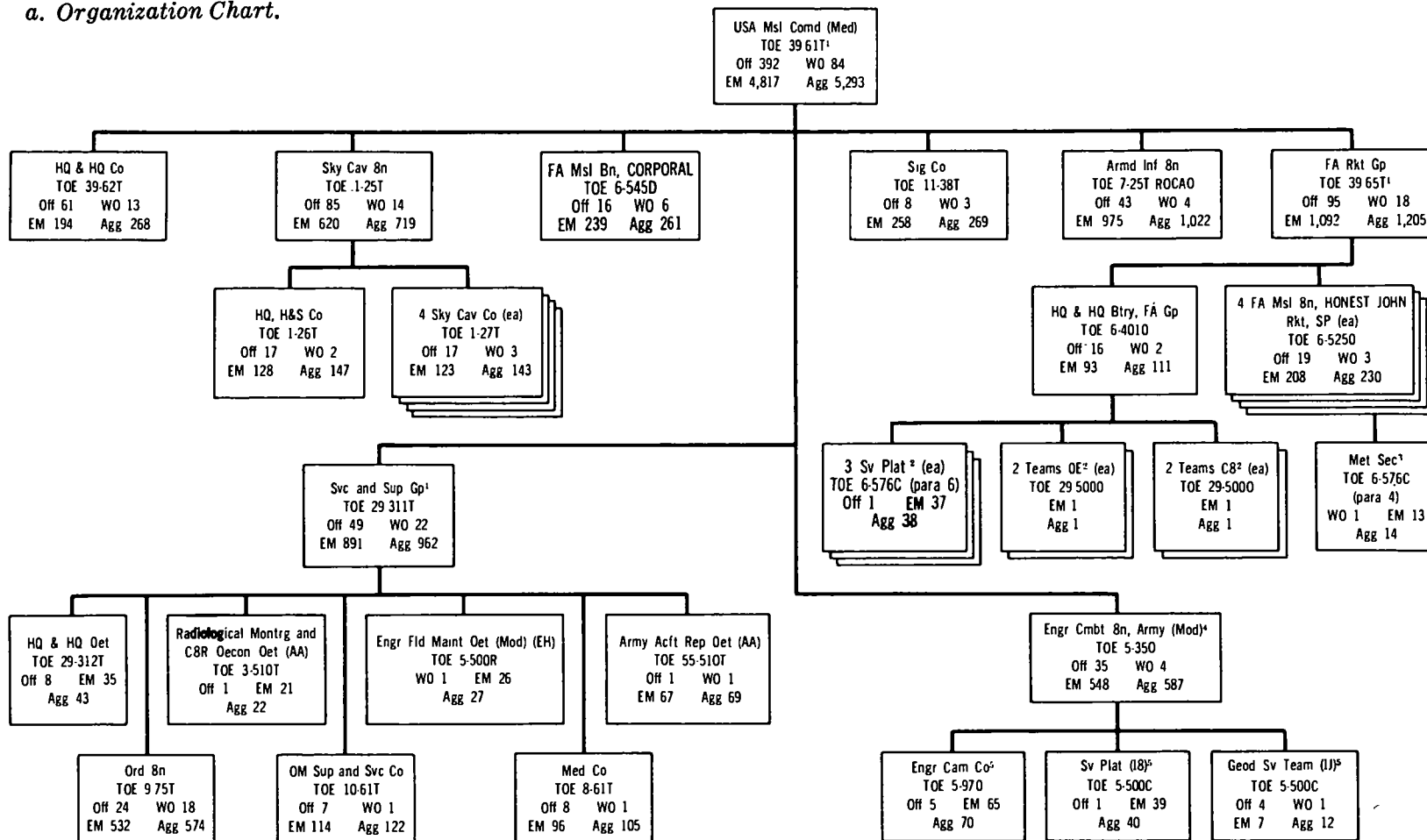
	1	2	3	4	5	6	7	8
	Item	Total msl comd	HQ & HQ co	FA msl bn, HONEST JOHN rkt, SP (aug) ¹	Sig co	Rifle co	Spt co	Engr cmbt co
1								
	<i>AIRCRAFT</i>							
2	Airplane, obsn, lt.....	2	2					
3	Airplane, cmbt survl.....	4	4					
4	Helicopter, util.....	2	2					
5	Total aircraft.....	8	8					
	<i>TRACKED VEHICLES</i>							
6	Tractor, full-tracked, low-speed, diesel-driven, med....	3		1				2
7	Total tracked vehicles.....	3		1				2

	1	2	3	4	5	6	7	8
1	Item	Total msl comd	HQ & HQ co	FA msl bn, HONEST JOHN rkt, SP (aug) ¹	Sig co	Rifle co	Spt co	Engr cmbt co
	WHEELED VEHICLES							
8	Decontaminating apparatus, power-driven, trk-mtd....	1					1	
9	Heating and tiedown unit, 762-mm rkt, trk-mtd....	8		8				
10	Launcher, 762-mm rkt, trk-mtd....	4		4				
11	Trk, amb, frontline, ¼-ton, 4x4....	1		1				
12	Trk, util, ¼-ton, 4x4....	50	13	16	7	3	6	5
13	Trk, util, ¼-ton, 4x4, carr for 106-mm rifle....	2				2		
14	Trk, amb, fld, ¼-ton, 4x4....	4					4	
15	Trk, cgo, ¾-ton, 4x4....	57	4	17	19	5	5	7
16	Trk, cgo, ¾-ton, 4x4, WWN....	4		4				
17	Trk, cgo, 2½-ton, 6x6, LWB....	50	5	8	8		24	5
18	Trk, cgo, 2½-ton, 6x6, LWB, WWN....	19	4	8	3	1	3	
19	Trk, dump, 2½-ton, 6x6....	12						12
20	Trk, shop van, 2½-ton, 6x6....	8	1	5			2	
21	Trk, tk, gas, 2½-ton, 6x6, W kit segregator....	4	2				2	
22	Trk, cgo, 5-ton, 6x6, XLWB, WWN....	14					14	
23	Trk, tractor, 5-ton, 6x6, SWB....	1		1				
24	Trk, tractor, 5-ton, 6x6, SWB, WWN....	3					1	2
25	Trk, med wkr, 5-ton, 6x6, WWN....	7		5			2	
26	Total wheeled vehicles....	249	29	77	37	11	64	31
	TRAILERS							
27	Battery charger genr set, tlr-mtd, PP-1087/U....	2		2				
28	Battery charger, W 5-kw genr, tlr-mtd, PP-775/U....	1					1	
29	Chassis, tlr, genr, 2½-ton, 2-wheel....	1	1					
30	Genr set assembly, gas eng, tlr-mtd, PU-322/G....	1			1			
31	Genr set, gas eng, tlr-mtd, PU-290/MR....	3	1		2			
32	Genr set, gas eng, tlr-mtd, PU-332/G....	1	1					
33	Pneumatic tool and compressor outfit, 210 CFM, tlr-mtd....	1						1
34	Stlr, low-bed, 25-ton, 4-wheel....	4		1			1	2
35	Tlr, amph, cgo, ¼-ton, 2-wheel....	40	12	13	3	3	4	5
36	Tlr, cgo, ¾-ton, 2-wheel....	34	4	11	11	5	3	
37	Tlr, cgo, 1½-ton, 2-wheel....	52	5	8	5		30	4
38	Tlr, tk, water, 1½-ton, 2-wheel....	7	1	2	1	1	1	1
39	Tlr, basic util, 2½-ton, 2-wheel....	9						9
40	Tlr, 762-mm rkt transporter....	8		8				
41	Water purification equipment set, tlr-mtd, diatomite filter, 600 GPH....	2						2
42	Total tlr....	166	25	45	23	9	40	24
	MAJOR VEHICULAR EQUIPMENT							
43	Angledozer, earth-moving, cable-op, for tractor, med....	2						2
44	Angledozer, earth-moving, hyd for tractor, med....	1		1				
45	Grader, road, mtz, diesel-driven, hv....	1						1
46	Loader, scoop-type, diesel-driven, 4-wheel, 1½ cu yd....	1						1

¹ Includes electronic meteorological section aug.

1.24. U.S. Army Missile Command (Medium), TOE 39-61 T (Tentative)

a. Organization Chart.



¹ Agg totals shown are extracted from TOE of component units and do not agree with agg totals shown in TOE 39-61T.

² Augments the HQ and HQ btry, FA gp. Agg totals are included in the FA rkt gp agg total.

³ Met sec augments the FA msl.bn, HONEST JOHN rkt, SP, and is not included in the agg total strength shown for the HONEST JOHN bn; met sec agg total is included in the FA rkt gp agg total.

⁴ (Mod) less one co (TOE 5-37D).

⁵ Augments the engr cmbt bn, army. Agg totals are included in the bn agg total.

*b. U.S. Army Missile Command (Medium)—
Capabilities.*

- (1) Supports, by nuclear fire, counter-aggression forces or reinforces national forces in localized hostilities.
- (2) Acquires and develops target data.
- (3) Supports itself logistically after resupply has been delivered to the missile command.
- (4) Provides limited third echelon engineer, ordnance, and signal maintenance.
- (5) Provides third echelon aircraft maintenance.
- (6) Individuals of this unit, except chaplains and medical personnel, can fight as infantrymen when required. The unit has the capability of defending itself and its installation against hostile ground attack.

c. U.S. Army Missile Command (Medium)—Weapons.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Item	Total mal cmd ¹	HQ & HQ co	FA mal bn, CORPORAL	Sig co	Armd inf bn.	Sky cav bn			FA rkt gp							Svc and sup gp								Engr cmbt bn (mod) (aug)				
						Total bn	HQ, H&S co	4 sky cav co (ea)	Total gp	HQ & HQ btry	3 sv plat (ea) ²	2 teams DE (ea) ³	2 teams CB (ea) ³	4 met sec (ea) ³	4 FA mal bn, HONEST JOHN rkt, SP (ea)	Total gp	HQ & HQ det	Radl monitg and CBR decon det	Engr fid maint det (mod)	Army acft rep det	QM sup and svc co	Med co	Ord bn	Total bn (mod) (aug)	Engr cmbt bn (mod) ⁴	Engr cam co ⁵	Sv plat ⁵	Good sv team ⁵
2 Carbine, cal .30	1,418	152	152	137	81	(244)	76	42	(67)		17			4		(545)	18	18	1	45	81	89	293	(40)			31	9
3 Gun, mach, cal .30, Bng, M1917A1	2			2																								
4 Gun, mach, cal .30, Bng, M1919A4	42		11		16	(4)		1								(11)	2						9					
5 Gun, mach, cal .30, Bng, M1919A6	72				72																							
6 Gun, mach, cal .50, Bng, hv bbl, flex.	68			5	22				(5)	1			1			(22)		1	2		3		16	(14)	14			
7 Gun, mach, 7.62-mm, lt-weight, GP, on mount	76								(62)	2				15										(14)	14			
8 Gun, submach, cal .45	264			46	109	(34)	34		(31)		9		1			(44)	7	1			4		32					
9 Launcher, grenade, rifle	229			22	183	(24)		6																				
10 Launcher, 762-mm rkt, trk-mtd	16								(16)						4													
11 Launcher, GM	3		3																									
12 Launcher, rkt, 3.5-in.	196		13	5	70	(16)		4	(50)	2				12		(17)	2		1		3		11	(25)	25			
13 Mortar, 81-mm, on mount	12				12																							
14 Pistol, auto-semiauto, cal .45	417	52	5	6	167	(112)	8	26	(29)	9				5		(32)	3			1	1	6	21	(14)	9	2		3
15 Rifle, auto, cal .30, Bng, M1918A2	96				72	(24)		6																				
16 Rifle, semiauto, 7.62-mm, lt bbl	1,521								(1,004)	100		1	1		225									(517)	448	68		
17 Rifle, U.S. cal .30	1,558	62	102	80	589	(305)	29	69	(72)		12			9		(339)	14	3	26	23	36	10	227	(9)			9	
18 Rifle, U.S. cal .30, sniper	36				36																							
19 Individual weapons	5,539	266	259	291	1,237	(743)	147	149	(1,203)	109	38	1	1	14	230	(960)	42	22	27	69	122	105	573	(580)	458	70	40	12
20 Crew-served weapons	487		27	12	192	(20)		5	(133)	5				1	31	(50)	4	1	3		6		36	(53)	53			
21 Total weapons	6,026	266	286	303	1,429	(763)	147	154	(1,336)	114	38	1	1	15	261	(1,010)	46	23	30	69	128	105	609	(633)	511	70	40	12

¹ Totals shown will not correspond with totals shown in TOE 39-61T. Totals shown are derived from TOE of component units.² Augments the HQ and HQ btry, FA gp.³ Met sec, TOE 6-576C, augments the FA mal bn, HONEST JOHN rkt, SP.⁴ (Mod) less one co (TOE 5-37D).⁵ Augments the engr cmbt bn, army.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Item	Total mal comd ¹	HQ & HQ co	FA msl bn, CORPORAL	Sig co	Armd inf bn	Sky cav bn				FA rkt gp						Svc and sup gp								Engr embt bn (mod) (aug)				
						Total bn	HQ, H&S co	4 sky cav co (ea)	Total gp	HQ & HQ btry	3 sv plat (ea) ²	2 teams DE (ea) ²	2 teams CB (ea) ²	4 met sec (ea) ²	4 FA msl bn, HONEST JOHN rkt, SP (ea) ²	Total gp	HQ & HQ det	Radl monitg and CBR decon det	Engr fld maint det (mod)	Army acft rep det	QM sup and svc co	Med co	Ord bn	Total bn (mod) (aug)	Engr embt bn (mod) ⁴	Engr cam co ³	Sv plat ⁵	Geod sv team ⁵
AIRCRAFT																												
2 Airplane, transport.....	7	7																										
3 Airplane, transport, util.....	16					(16)		4																				
4 Airplane, obsn, lt.....	11	2				(9)	1	2																				
5 Airplane, util.....	16					(16)		4																				
6 Helicopter, obsn.....	3	2				(1)	1																					
7 Helicopter, transport, lt.....	4	4																										
8 Helicopter, util.....	20	2				(18)	2	4																				
9 Total aircraft.....	77	17				(60)	4	14																				
TRACKED VEHICLES																												
10 Carrier, hv mortar.....	4				4																							
11 Carrier, pers, full-tracked.....	77				77																							
12 Tk recovery vehicle, med.....	6				6																							
13 Tractor, full-tracked, high-speed, med.....	3		3																									
14 Tractor, full-tracked, low-speed, diesel-driven, med.....	10		1						(4)						1									(5)	5			
15 Total tracked vehicles.....	100		4		87				(4)						1									(5)	5			
WHEELED VEHICLES																												
16 Air servicer, trk-mtd, 5-ton, 6x6.....	5		5																									
17 Compressor, reciprocating, power-driven, air, trk-mtd, gas-driven, 80 CFM, 5,000 psi, air-cooled, winterized.....	7		2													(1)							1	(4)		4		
18 Firefighting equipment set, trk-mtd, Army acft crash, set No. 21.....	4					(4)		1																				
19 Firefighting equipment set, trk-mtd, GM.....	2		2																									
20 Firing set, GM, trk-mtd.....	2		2																									
21 Launcher, 762-mm rkt, trk-mtd.....	16								(16)						4													

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Item	Total mal comd ¹	HQ & HQ co	FA mal bn, CORPORAL	Sig co	Armd inf bn	Sky cav bn				FA rkt gp						Svc and sup gp								Engr cmbt bn (mod) (aug)				
						Total bn	HQ, H&S co	4 sky cav co (ea)	Total gp	HQ & HQ btry	3 sv plat (ea) ²	2 teams DE (ea) ²	2 teams CB (ea) ²	4 met sec (ea) ²	4 FA mal bn, HONEST JOHN rkt, SP (ea)	Total gp	HQ & HQ det	Radl montrg and CBR decon det	Engr fld maint det (mod)	Army acft rep det	QM sup and svc co	Med co	Ord bn	Total bn (mod) (aug)	Engr cmbt bn (mod) ⁴	Engr cam co ⁴	Sv plat ⁵	Good sv team ⁵
22 Missile test station, trk-mtd	3		2													(1)							1					
23 Servicing platform, 5-ton, 6x6	2		2																									
24 Shop equipment, decon, trk-mtd	3															(3)	3											
25 Signal Corps repair shop, trk-mtd, 2½-ton, 6x6	2			2																								
26 Tool set, sp fld maint, trk, propellant svc, 5-ton, 6x6	1															(1)							1					
27 Tool set, sp fld maint, compressor, reciprocating, power-driven, trk-mtd	1															(1)							1					
28 Tool set, sp fld maint, svc platform, trk-mtd, 5-ton, 6x6	1															(1)							1					
29 Trk, amb, frontline, ¼-ton, 4x4	13				4	(4)	4		(4)						1								32	(1)	1			
30 Trk, util, ¼-ton, 4x4	306	25	17	12	49	(27)	11	4	(95)	12	5			1	16	(50)	8	1	1	1	4	3	32	(31)	25	5		1
31 Trk, amb, fld, ¾-ton, 4x4	9	1	1													(7)						7						
32 Trk, cgo, ¾-ton, 4x4	216	12	16	30	2	(24)	12	3	(87)	11	4				16	(19)	2			1	2	1	13	(26)	16	9	1	
33 Trk, cgo, ¾-ton, 4x4, WWN	21				2				(17)	1					4									(2)				2
34 Trk, cgo, 2½-ton, 6x6, LWB	215	11	6	7	8	(21)	5	4	(35)	3				2	6	(111)	3	2	2	1	23	4	76	(16)	10	2	4	
35 Trk, cgo, 2½-ton, 6x6, LWB, WWN	88		12	14	9	(5)	1	1	(35)	3					8	(9)		1			2	1	5	(4)	3		1	
36 Trk, shop van, 2½-ton, 6x6	38		3			(8)		2	(16)						4	(11)							11					
37 Trk, shop van, 2½-ton, 6x6, WWN	4								(4)					1														
38 Trk, tk, gas, 2½-ton, 6x6, LWB	20	2			4	(8)		2								(6)					5		1					
39 Trk, tk, water, 2½-ton, 6x6	3															(3)							3					
40 Trk, tractor, 2½-ton, 6x6, LWB	1															(1)							1					
41 Trk, tractor, 2½-ton, 6x6, LWB, WWN	1															(1)			1									
42 Trk, cgo, 5-ton, 6x6, LWB	21		4		9	(8)	8																					
43 Trk, cgo, 5-ton, 6x6, LWB, WWN	6				4	(2)	2																					
44 Trk, dump, 5-ton, 6x6	3																							(3)	3			
45 Trk, dump, 5-ton, 6x6, WWN	24																							(24)	24			
46 Trk, med wkr, 5-ton, 6x6	4															(4)							4					
47 Trk, med wkr, 5-ton, 6x6, WWN	34		1		2	(1)	1		(20)						5	(9)					1		8	(1)	1			
48 Trk, propellant, svc, 5-ton, 6x6	4		4																									
49 Trk, tractor, 5-ton, 6x6, SWB	16								(4)						1	(12)				5			7					
50 Trk, tractor, 5-ton, 6x6, SWB, WWN	6		1																					(5)	5			

[illegible]

¹ Totals shown will not correspond with totals shown in TOE 39-61T. Totals shown are derived from TOE of component units.

² Augments the HQ and HQ btry, FA gp.

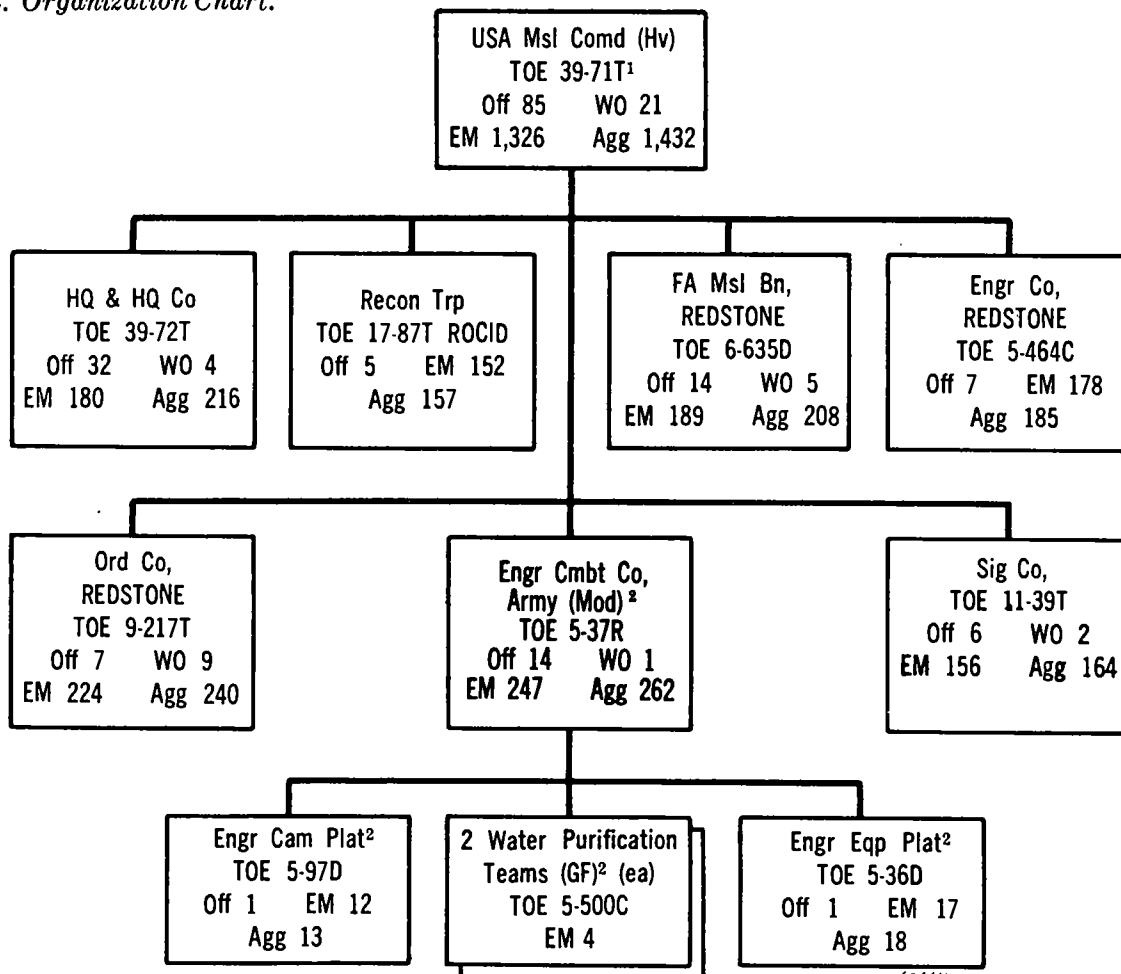
³ Met sec, TOE 6-576C, augments the FA msl bn, HONEST JOHN rkt, SP

⁴ (Mod) less one co (TOE 5-37D).

⁵ Augments the engr combt bn, army.

1.25. U.S. Army Missile Command (Heavy), TOE 39-71T (Tentative)

a. Organization Chart.



¹Agg totals shown are extracted from TOE of component units and do not agree with agg totals shown in TOE 39-71T.

²Modified by C 2 (Tentative). Camouflage plat, water purification teams, and equipment plat augment the engr cmbt co, army, and are included in the co agg total.

b. U.S. Army Missile Command (Heavy)—Capabilities.

- (1) Supports, by nuclear fire, U.S. and Allied ground forces.
- (2) Delivers nuclear fire on targets beyond the range and power of other field artillery units.
- (3) Provides for mass destruction of large area targets and continuous fire support during displacement.

- (4) Provides organizational supply and maintenance of the missile, the missile system, and all other organic equipment.
- (5) Provides third echelon engineer, ordnance, and signal supply and maintenance.
- (6) Provides limited evacuation of wounded and minimum combat medical care.

- (7) Provides radiation detection and decontamination.
- (8) Supports itself logistically after resupply has been delivered to the missile command.

- (9) Individuals of this unit, except chaplains and medical personnel, can fight as infantrymen when required. The unit has the capability of defending itself and its installation against hostile ground attack.

c. U.S. Army Missile Command (Heavy)—Weapons.

1	2	3	4	5	6	7	8	9
Weapons	Total msl cmd	HQ & HQ co	FA msl bn, RED-STONE	Engr cmbt co, army (mod) (aug) ¹	Recon trp	Engr co, RED-STONE	Ord co, RED-STONE	Sig co
2 Carbine, cal .30.....	470	107	115	61	6	107		74
3 Gun, mach, cal .30, Bng, M1919A4, flex, W eqp.....	30	3	5	6	15			1
4 Gun, mach, cal .50, Bng, hv bbl, flex, W eqp.....	24		8	5		7		4
5 Gun, mach, 7.62-mm, lt-weight, GP, on mount.....	10						10	
6 Gun, submach, cal .45.....	73	7		11	21	1		33
7 Gun, tk, cmbt, full-tracked, lt gun.....	7				7			
8 Launcher, grenade, rifle.....	28			5	12			11
9 Launcher, GM, XM30.....	2		2					
10 Launcher, rkt, 3.5-in.....	38	2	13	9	6	4	3	1
11 Mortar, 81-mm, on mount.....	3				3			
12 Pistol, auto-semiauto, cal .45.....	93	27	6	4	45		6	5
13 Rifle, auto, cal .30.....	6				6			
14 Rifle, semiauto, 7.62-mm, lt bbl.....	271			31			240	
15 Rifle, U.S., cal .30.....	538	74	85	155	95	77		52
16 Individual weapons.....	1,479	215	206	267	185	185	246	175
17 Crew-served weapons.....	114	5	28	20	31	11	13	6
18 Total weapons.....	1,593	220	234	287	216	196	259	181

¹ Includes one engr camouflage platoon, two water purification teams, and one engr equipment platoon

d. U.S. Army Missile Command (Heavy)—Vehicles and Major Vehicular Equipment.

1	2	3	4	5	6	7	8	9
Item	Total msl cmd	HQ & HQ co	FA msl bn, RED-STONE	Engr cmbt co, army (mod) (aug) ¹	Recon trp	Engr co, RED-STONE	Ord co, RED-STONE	Sig co
<i>AIRCRAFT</i>								
2 Airplane, cmbt survl.....	4	4						
3 Airplane, util.....	2	2						
4 Helicopter, util.....	2	2						
5 Total aircraft.....	8	8						

See footnote at end of table.

1	2	3	4	5	6	7	8	9
Item	Total msl comd	HQ & HQ co	FA msl bn, RED- STONE	Engr cmbt co, army (mod) (aug) ¹	Recon trp	Engr co, RED- STONE	Ord co, RED- STONE	Sig co
TRACKED VEHICLES								
6 Carrier, pers, full-tracked.....	8				8			
7 Tank, cmbt, full-tracked, lt gun.....	7				7			
8 Tank recovery vehicle, med.....	1				1			
9 Tractor, full-tracked, low-speed, diesel- driven, convl xmsn, 17,100—24,000-lb DBP.....	3		1	2				
10 Tractor, full-tracked, low-speed, diesel- driven, med DBP, W angledozer, earth- moving, cable.....	1			1				
11 Total tracked vehicles.....	20		1	3	16			
WHEELED VEHICLES								
12 Compressor, reciprocating, power-driven, trk-mtd, 80 CFM, air-cooled, winterized.....	3		2				1	
13 Firefighting equipment set, Army acft crash, trk-mtd, set No. 21.....	1	1						
14 Firefighting equipment set, trk-mtd, W tlr.....	2		2					
15 Shop equipment, contact maint, trk-mtd, set No. 3.....	4			1		3		
16 Shop equipment, org rep, lt, trk-mtd, set No. 2.....	1					1		
17 Trk, util, ¼-ton, 4x4.....	91	19	19	10	18	1	16	8
18 Trk, amb, fld, ¼-ton, 4x4.....	3	2	1					
19 Trk, cgo, ¾-ton, 4x4.....	69	14	13	11		4	7	20
20 Trk, cgo, ¾-ton, 4x4, WWN.....	7				1		6	
21 Trk, comd, ¾-ton, 4x4.....	1			1				
22 Trk, H202, svc, ¾-ton, 4x4, XM387.....	2		2					
23 Trk, cgo, 2½-ton, 6x6, LWB.....	66	15	8	5	1	10	22	5
24 Trk, cgo, 2½-ton, 6x6, LWB, WWN.....	26	3	7	2	1		9	4
25 Trk, cgo, 2½-ton, WWN, W kit, power accessories, REDSTONE.....	1						1	
26 Trk, cgo, 2½-ton, WWN, W kit, preser- vation.....	1						1	
27 Trk, cgo, 2½-ton, WWN, W kit, rep parts, stor bin.....	1						1	
28 Trk, cgo, 2½-ton, WWN, W kit, rep parts, stor bulk.....	1						1	
29 Trk, dump, 2½-ton, 6x6.....	12			12				
30 Trk, shop van, 2½-ton, 6x6.....	7						7	
31 Trk, shop van, 2½-ton, 6x6, WWN.....	2						2	
32 Trk, shop van, 2½-ton, 6x6, fire con and test, REDSTONE.....	3		2				1	
33 Trk, shop van, 2½-ton, 6x6, mech rep.....	1						1	
34 Trk, shop van, 2½-ton, 6x6, pneumatic, checkout and rep.....	1						1	
35 Trk, tk, gas, 2½-ton, 6x6.....	3	3						
36 Trk, tk, water, 2½-ton, 6x6.....	2						2	
37 Trk, tractor, 2½-ton, 6x6, SWB.....	4						4	

See footnote at end of table.

FM 101-10
PART I
1.25

1	2	3	4	5	6	7	8	9
Item	Total mal comd	HQ & HQ co	FA mal bn, RED- STONE	Engr cmbt co, army (mod) (aug) ¹	Recon trp	Engr co, RED- STONE	Ord co, RED- STONE	Sig co
38 Trk, cgo, 5-ton, 6x6, LWB.....	3		1			2		
39 Trk, med wkr, 5-ton, 6x6.....	1					1		
40 Trk, med wkr, 5-ton, 6x6, WWN.....	5		1					4
41 Trk, tractor, 5-ton, 6x6, SWB.....	11					6	5	
42 Trk, tractor, 5-ton, 6x6, SWB, WWN.....	54		12	1		38	3	
43 Trk, tractor, 10-ton, 6x6.....	1		1					
44 Total wheeled vehicles.....	390	57	71	43	21	66	91	41
<i>TRAILERS</i>								
45 Cooling tower, liq, stlr-mtd.....	1					1		
46 Dolly tlr converter, 8-ton, 2-wheel.....	4		4					
47 Dolly tlr converter, 18-ton, 4-wheel.....	2					2		
48 Generating and charging plant, carbon dioxide, stlr-mtd, mtr-driven.....	1					1		
49 Generating and charging plant, oxy-nitro- gen, stlr-mtd, W van-type body.....	10					10		
50 Genr set assembly, gas eng, tlr-mtd, PU- 322/G.....	1							1
51 Genr set, gas eng, tlr-mtd, PU-332/G.....	1							1
52 Stlr, van, con comp, test and checkout.....	1						1	
53 Stlr, van, guidance comp, test and checkout.....	1						1	
54 Stlr, van, M348A1, clas comp, W eqp.....	1						1	
55 Stlr, van, planetary.....	1						1	
56 Stlr, cgo van, 6-ton, 2-wheel.....	1					1		
57 Stlr, alcohol, 9-ton, 3,000-gal, 2-wheel, REDSTONE.....	5		2				3	
58 Stlr, liq oxy, 9-ton, REDSTONE.....	4		4					
59 Stlr, stake, 10-ton, 2-wheel.....	1						1	
60 Stlr, aux wkr, 12-ton, 4-wheel, WWN, REDSTONE.....	2		2					
61 Stlr, tk, gas, 12-ton, 4-wheel.....	4					4		
62 Stlr, low-bed, 20-ton.....	2			2				
63 Stlr, low-bed, 25-ton 4-wheel.....	4		1	1		2		
64 Shop equipment, GP, hv, stlr-mtd.....	1					1		
65 Solidifying plant, liq, stlr-mtd.....	1					1		
66 Storage unit, low-pressure, liq oxy, stlr-mtd.....	12					12		
67 Tlr, amph, cgo, ¼-ton, 2-wheel.....	43	15		5	2	1	16	4
68 Tlr, cgo, ¼-ton, 2-wheel.....	18		14	4				
69 Tlr, cgo, ¾-ton, 2-wheel.....	46	10	11		1	3	11	10
70 Tlr, cgo, ¾-ton, W kit, power distr, RED- STONE.....	1						1	
71 Tlr, cgo, 1½-ton, 2-wheel.....	81	16	13	6	2	4	35	5
72 Tlr, cgo, 1½-ton, W kit, rep parts, stor bin, REDSTONE.....	2						2	
73 Tlr, tk, water, 1½-ton, 2-wheel.....	8	2	1	1	1	1	1	1
74 Tlr, util, 2½-ton, 2-wheel.....	13		2	11				
75 Tlr, flat-bed, 10-ton.....	2			2				
76 Welding equipment set, tlr-mtd, set No. 1.....	1			1				
77 Total tlr.....	276	43	54	33	6	44	74	22

PERS

1	1	2	3	4	5	6	7	8	9
	Item	Total msl comd	HQ & HQ co	FA msl bn, RED- STONE	Engr cmbt co, army (mod) (aug) ¹	Recon trp	Engr co, RED- STONE	Ord co, RED- STONE	Sig co
	MAJOR VEHICULAR EQUIPMENT								
78	Angledozer, cable-op, 17,100—24,000-lb DBP, tractor.....	1		1					
79	Crane-shovel, basic unit, trk-mtd, 20-ton, ¾ cu yd.....	2			2				
80	Crane-shovel, power unit, trk-mtd, 25-ton, REDSTONE.....	1						1	
81	Crane-shovel, trk-mtd, 25-ton, gas-driven, 1 cu yd.....	2		2					
82	Grader, road, mtz, diesel-driven, 14,300-lb pressure at blade, 12-ft blade.....	3			3				

¹ Includes one engr camouflage platoon, two water purification teams, and one engr equipment platoon.

1

CHAPTER 2

PERSONNEL

Section I. GENERAL

2.1. General

This chapter provides unclassified personnel data for staff officers on division, corps, field army, theater army logistical command and subordinate logistical commands, and theater staffs within a theater of operations. (For classified data, see FM 101-10, part III, chapter 2.)

a. Section I outlines the contents of the chapter.

b. Section II enables the staff officers to estimate losses and the requirements for replacements in—

- (1) *Combat zone forces of division size or greater, both for short periods of a particular type of combat action and for longer periods containing a variety of types of action.*
- (2) *Forces in the communications zone.*

- (3) *Theaters of operation.* Two methods of varying accuracy are given. In each case, loss estimates are given for the unit concerned as a whole with breakdowns by branch of service.

For classified data pertaining to estimation of losses and requirements for replacements in a theater of operations where the enemy employs nuclear weapons, see FM 101-10, part III, chapter 2, section II.

c. Section III gives a basis for estimates of prisoners of war by giving experience data under varying conditions of World War II.

d. Section IV gives a basis for estimates of decorations and mail by giving experience data from World War II and the Korean War.

e. Section V guides the staff officer in making the internal arrangements of division, corps, and field army headquarters.

Section II. LOSSES AND REPLACEMENTS¹

2.2. General

A personnel loss is any reduction in the assigned strength of a unit. These losses are caused primarily by enemy action, disease, accidents, and administrative action. The rate of loss varies with the theater of operations, climate, terrain, condition and state of training of troops, type of activity, the enemy, and numerous other factors. Each division and corps has its own loss experience dependent upon its own situation. Loss rates by arm or service and by military occupational specialty within corps and division vary with the amount of exposure of the particular category of personnel to the various causes of losses.

a. *Categories of Losses.* Personnel losses result from three general categories.

- (1) *Battle casualties.* Those losses incurred in action, including—
 - (a) Killed in action.
 - (b) Died of wounds and injuries received in action.
 - (c) Wounded or injured in action.
 - (d) Missing in action or captured by the enemy.
- (2) *Nonbattle casualties.* These losses include—
 - (a) Dead, nonbattle.
 - (b) Missing, nonbattle.
 - (c) Evacuated sick and injured, nonbattle.
- (3) *Administrative losses.* Attrition from this category is relatively small and

¹ Losses and strengths considered herein do not include Air Force personnel.

dependent upon current administrative policies. These losses include—

- (a) Transfers to other units, disciplinary barracks, etc.
- (b) Absent without leave and desertion.
- (c) Rotational personnel.
- (d) Discharges.

b. *Gross Losses.* In addition to those killed, captured, or missing, gross losses include those evacuated to hospitals and dropped from the rolls of their units. In division, corps, and field army units, any man evacuated to a hospital is dropped from unit rolls and carried on the rolls of the Department of the Army Medical Holding Detachment and is not chargeable against the authorized theater strength. In the theater army logistical command, men are dropped from unit rolls after they remain in hospitals over 90 days or when it is foreseen that they will be hospitalized in excess of 90 days.

c. *Net Losses.* Net losses are gross losses less those returned to duty within the theater. Net losses are computed only at theater level and are used as a basis for estimates of personnel required from the continental United States (CONUS) to maintain theater strength.

d. *Loss Experience.*

- (1) Factors and figures which appear in the tables of this section are based primarily upon World War II and the Korean War experience and will not apply necessarily during another war. For future planning, loss experience of past wars must be modified by evaluating new factors applicable to new conditions. As a war progresses, every echelon of command gradually builds up loss experience which more accurately reflects the current conditions. *It is emphasized that even the most complete and accurate figures relating to past wars should not be relied upon as valid for any future war.* With past experience as a basis, good judgment and sound knowledge of principles must be used to develop new experience tables applicable to new conditions. Administrative losses are based on changing policies and are not

adaptable to the establishment of loss tables based on past experience. For this reason, experience tables for administrative losses are not included in this manual.

- (2) Since the disease rate makes up a large part of the nonbattle loss rate, the overall loss rate has seasonal variations and depends upon the region in which the force is operating. Accidents are the most frequent cause of all losses. During World War II, losses from accidents exceeded those from disease for the first time in history. Every 5th death was related to a nonbattle injury, while every 18th death was attributed to disease. In Korea in 1952, 10 soldiers died from vehicular accidents for every soldier that died as a consequence of an infective or parasitic disease.

2.3. Nuclear Loss Estimates

a. *General.* The use of nuclear weapons by the enemy against U.S. forces will result in increased battle casualties. Battle casualties from nuclear weapons may be divided into two general categories:

- (1) Battle casualties sustained when a military unit is destroyed. The magnitude of such loss is so great that replacements with individuals is not feasible. Replacements for these battle casualties will be provided for by unit replacement.
- (2) Battle casualties sustained by units which are on the periphery of the area of damage. Replacements for battle casualties in this category will be provided from survivors or destroyed units and by personnel in the individual replacement system.

b. *Factors Influencing Losses.* No valid experience data exist from which loss experience tables can be compiled. The problem of estimating the number of replacements (both unit and individual) required to replace losses to nuclear weapons contains many variable factors.

Among the more important of these factors are—

- (1) Frequency of enemy employment of nuclear weapons.
- (2) Types and yields of weapons employed.
- (3) Types of targets selected for nuclear weapon attack.
- (4) Effectiveness of enemy target location system.
- (5) Accuracy of enemy delivery means.
- (6) Protective measures adopted by own forces.

c. Estimation of Battle Casualties. Effective battle casualty estimation requires an aggressive effort on the part of all agencies, particularly intelligence agencies, to provide specific data to eliminate the variable factors outlined in *b* above or to permit reasonable assumptions to be made concerning these variable factors. The validity of battle casualty estimation will be directly proportional to the degree of refinement which can be made in these factors. For classified information pertaining to nuclear battle casualties under conditions of nuclear warfare, see FM 101-10, part III, chapter 2, section II.

2.4. Unit Replacements

Each theater army will be authorized separate units to be employed as replacements for units which may be rendered ineffective as a result of a nuclear attack. The numbers and types of units furnished will be determined by the Department of the Army, based upon the recommendations of the theater commander (par. 2.3).

2.5. Combat Zone Estimates

a. General. The procedures and data contained in this paragraph are applicable to the estimation of nonnuclear losses. Because of the possible magnitude of nuclear battle casualties and the effect which such losses may have on tactical operations, nuclear battle casualties should be estimated separately. See FM 101-10, part III, chapter 2, section II.

b. Purpose of Estimate. Personnel loss estimates at corps and division levels are used to

anticipate the effect of losses on the tactical plan and to prepare for the handling of replacements within the commands. The estimates must answer three questions—the strength at any given time, the losses to be anticipated for a specific situation, and the distribution of these losses by arm or service and military occupational specialty. Combat estimates are of two types—short-period estimates (5 days or less) and long-period estimates (over 5 days). Estimates at field army level are used for the same purposes as at corps and division levels. In addition, they are used as a basis for allocation of available replacements and to inform higher headquarters of anticipated replacement requirements. Field army and corps headquarters use both short-period estimates (5 days or less) and long-period estimates (over 5 days). Divisions normally use only short-period estimates.

c. Factors. In calculating losses, there are two major factors to be considered:

- (1) Loss rates applicable to the specific situation are expressed as percentage of strength or as number per thousand of average strength of any given period. In compilation and use of loss data, units whose loss rates are about the same because of similar operating conditions are grouped together.
- (2) Loss rates are applied to the strength of the particular command under consideration. There are two different strengths used:
 - (a) *Authorized strength* is table of organization and equipment (TOE) strength plus any additional personnel authorized by higher headquarters. Authorized strength is used in long-range planning and when the assigned strength is unknown or rapidly fluctuating.
 - (b) *Assigned strength* includes all personnel carried as assigned on the unit's roster. Assigned strength is used, when known, in long-period estimates if it differs materially from authorized strength and if it will remain reasonably stable during the estimate period.

d. *Short-Period Estimates (periods not in excess of 5 days).*

(1) *Daily personnel losses as percentage of strength. (Do not use this table for loss-estimate periods over 5 days.)*

	1	2	3	4	5	6	7	8	9	10
		Division in contact			Divisions in corps and field army reserve			Nondivisional units, corps, and field army ¹		
1	General type of operations for the force as a whole	Battle casualty (percentage)	Nonbattle casualty (percentage)	Total percentage	Battle casualty (percentage)	Nonbattle casualty (percentage)	Total percentage	Battle casualty (percentage)	Nonbattle casualty (percentage)	Total percentage
2	Covering and security force action.	0.9	0.3	1.2	0.3	0.3	0.6	0.3	0.1	0.4
	Attack:									
3	Meeting engagement.....	2.4	0.3	2.7	0.3	0.3	0.6	0.4	0.1	0.5
4	Of a position—1st day.....	3.8	0.3	4.1	0.4	0.3	0.7	0.5	0.1	0.6
5	Succeeding days.....	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
6	Of a fortified zone—1st day...	6.3	0.3	6.6	0.5	0.3	0.8	0.7	0.1	0.8
7	Succeeding days.....	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
	Defense:									
8	Meeting engagement.....	1.5	0.3	1.8	0.3	0.3	0.6	0.3	0.1	0.4
9	Of a position—1st day.....	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
10	Succeeding days.....	1.0	0.3	1.3	0.3	0.3	0.6	0.3	0.1	0.4
11	Of a zone—1st day.....	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
12	Succeeding days.....	1.6	0.3	1.9	0.3	0.3	0.6	0.4	0.1	0.5
13	Inactive situations ²	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4
14	Pursuit.....	1.3	0.3	1.6	0.3	0.3	0.6	0.3	0.1	0.4
15	Retirement and delayed action...	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4

¹Use divisional loss rates for units attached to a division.

²Forces in contact—neither side attacking.

(2) *Distribution of battle casualties by branch (divisions).*

	1	2	3	4
1	Branch	Infantry division (percentage)	Armored division (percentage)	Airborne division (percentage)
2	Infantry.....	93.0	62.0	85.6
3	Artillery.....	2.4	3.6	6.9
4	Armor.....	2.0	23.1	0.0
5	Engineers.....	1.5	3.3	3.9
6	All others.....	1.1	8.0	3.6

(3) *Distribution of infantry battle casualties by selected military occupational specialty within an infantry division. The combat effectiveness of an infantry division is most seriously affected by the personnel losses of its*

five battle groups. A total of 87.4 percent of the infantry battle casualties occurs among riflemen and weapons crewmen (and closely allied specialists), who constitute the larger portion of the infantry division battle group's strength.

(4) *Distribution of nonbattle casualties. Nonbattle casualties in each branch are in the same proportion to the total nonbattle casualties as the strength of that branch is to the total strength of the unit.*

(5) *Example. Calculate the total non-nuclear losses of an infantry division in the first 3 days of the defense of a sector and determine the number of infantry riflemen and weapons crewmen who become battle casualties.*

¹Calculations based upon World War II loss rate tables.

(a) *Total losses.*¹

Authorized strength of division (TOE).....	13,748
Assigned strength of division (assumed), beginning of first day.....	13,483
Losses, first day, defense of sector (2.2% x 13,483—(1) above, line 9, col 4).....	297
Assigned strength, end of first day.....	13,186
Losses, second day, defense of sector (1.3% x 13,186—(1) above, line 10, col 4).....	171
Assigned strength, end of second day.....	13,015
Losses, third day, defense of sector (1.3% x 13,015—(1) above, line 10, col 4).....	169
Assigned strength, end of third day.....	12,846
Total losses, 3 days (297 + 171 + 169).....	637

(b) *Battle casualties.*

First day, defense of sector (1.9% x 13,483—(1) above, line 9, col 2).....	256
Second day, defense of sector (1.0% x 13,186—(1) above, line 10, col 2).....	131
Third day, defense of sector (1.0% x 13,015—(1) above line 10, col 2).....	130
Total battle casualties.....	517

(c) *Infantry battle casualties.*

Infantry battle casualties (93% x 517—(2) above, line 2, col 2).....	480
Infantry riflemen and weapons crewmen battle casualties (87.4% x 480—(3) above).....	419

e. *Long-Period Estimates—Combat Zone (periods in excess of 5 days).*

(1) *Monthly personnel losses.*

(a) The percentages given in the following table are average figures for all theaters in World War II.

	1	2	3
	Troops	Battle casualties—percentage per month	Nonbattle casualties—percentage per month
1			
2	Infantry divisions in combat zone.....	10.00	8
3	Armored divisions in combat zone.....	8.00	7
4	Corps and field army nondivisional troops in combat zone.....	1.25	3

(b) The percentages given in the following table are based upon average Korean War experience 25 June 1950 to 25 July 1953.

Infantry Divisions

	1	2	3	4		
	Type of operation	Battle casualties per division per day	Battle casualties per division—percentage per month ¹	Status distribution—percentage		
				Killed	Wounded	Missing
2	Offensive:					
3	Against main enemy force.....	67	11.2	14.6	83.2	2.3
4	Against delaying force—					
5	Organized.....	26	4.3	18.2	69.6	12.2
6	Partly disorganized.....	12	2.0	18.8	75.9	5.3
7	Against fortified hill positions.....	34	5.7	17.5	79.4	3.1
8	Defensive:					
9	Against main enemy force.....	77	12.8	25.2	68.8	6.2
10	Main pressure on non-U.S. units.....	35	5.8	16.1	70.6	13.2
11	Withdrawal.....	119	19.8	15.2	44.5	40.2
12	Positional warfare.....	6	0.01	18.6	75.0	6.4

¹Based upon assumed average divisional strength of 18,000.

(2) *Types of battle casualties as percentage of total battle casualties.*

	1	2	3	4
1	Battle casualties	Infantry divisions (percentage)	Armored divisions (percentage)	Corps and field army nondivisional units (percentage)
2	Killed.....	16.5	18.0	16.0
3	Wounded.....	70.0	72.0	84.0
4	Captured and missing.....	13.5	10.0	Negligible

(3) *Distribution of losses by branch within divisions. See d(2) and (4) above.*

(4) *Distribution of battle casualties by branch within corps and larger units in the combat zone as percentage of total battle casualties.*

	1	2	3
1	Branch	Percentage	
		World War II	Korea War
2	Infantry.....	81.9	81.1
3	Artillery.....	4.5	5.7
	Field.....	(3.6)	
	Air defense.....	(0.9)	
4	Armor.....	6.6	5.3
5	Corps of Engineers.....	3.2	7.9
6	Army Medical Service.....	2.8	
7	Signal Corps.....	0.2	
8	Quartermaster Corps.....	0.1	
9	Ordnance Corps.....	0.2	
10	Transportation Corps.....	—	
11	Chemical Corps.....	0.3	
12	Military Police Corp.....	0.1	
13	Miscellaneous.....	0.1	

Note. The percentage figures given in the World War II portion of this table are the field battle casualty distribution as reported through data processing unit channels, European Theater of Operations, for the period 6 June 1944 through 31 March 1945. The figure for armor combines the percentages originally reported as armored forces (2.9 percent), tank destroyer (1.4 percent), and cavalry (2.3 percent). *In actual operations,*

the distribution of battle casualties by branch varies with the composition of the force, type of operation, etc.

(5) *Distribution of nonbattle casualties. See d(4) above.*

(6) *Example. Calculate the number of replacements required to bring 1st Corps up to authorized strength and to maintain it at that strength in combat for 15 days, assuming no nuclear losses, given—*

	Authorized strength	Assigned strength
Three infantry divisions.....	41,244	39,216
One armored division.....	14,617	13,871
Corps nondivisional troops.....	36,405	34,755
Total corps.....	92,266	87,842

(a) *Replacements needed now.*

Authorized (92,266)—assigned (87,842)..... 4,424

(b) *Estimated losses, 15 days.*

Infantry divisions ((1) above, line 2):	
Battle casualties $\frac{1}{2} \times 10\% \times 41,244$	2,062
Nonbattle casualties $\frac{1}{2} \times 8\% \times 41,244$	1,650
One armored division ((1) above, line 3):	
Battle casualties $\frac{1}{2} \times 8\% \times 14,617$	585
Nonbattle casualties $\frac{1}{2} \times 7\% \times 14,617$	512
Corps nondivisional troops ((1) above, line 4):	
Battle casualties $\frac{1}{2} \times 1.25\% \times 36,405$	228
Nonbattle casualties $\frac{1}{2} \times 3.0\% \times 36,405$	546
Total losses for 15 days.....	5,583

(c) *Total replacements required.*

Replacements needed now.....	4,424
Losses for 15-day period.....	5,583
Total.....	10,007

f. *Special Estimates for Airborne Operations.*

(1) *Personnel losses for forces conducting an airborne assault operation or an air-landed operation may be estimated by applying the applicable daily loss rates from the following table to the assigned strength of units actually committed to the operation.*

Note. Rates in this table are for planning purposes only. The rates for each airborne operation are different. The rates in this table are useful as a guide or for use in practicing estimate procedures.

	1	2	3	4	5	6	7
1	Type of operation and type of forces committed	First day (includes en route and in airhead) (percentage)			Succeeding days ¹ (percentage)		
		Nonbattle casualty	Battle casualty	Total	Nonbattle casualty	Battle casualty	Total
	Airborne assault operation:						
	Airborne or infantry division and attached troops:						
2	Assault echelon (parachute and/or assault aircraft) ²	0.3	9.3	9.6	0.3	2.0	2.3
3	Followup echelon.....	0.3	2.5	2.8	0.3	2.0	2.3
4	Corps troops.....	0.3	1.5	1.8	0.3	1.0	1.3
	Air-landed operation (inside secured airhead):						
5	Airborne or infantry division and attached troops (committed to combat upon arrival) ³	0.3	4.3	4.6	0.3	2.0	2.3
6	Corps troops.....	0.3	1.5	1.8	0.3	1.0	1.3

¹Upon linkup or when forces in the objective area are firmly established, rates and methods given in d or e above for an infantry division are applicable.

²For planning purposes and in the absence of experience factors, casualty figures for air-landed assault forces are assumed to be the same as for parachute assault forces.

³If not committed to combat, assess casualties as for corps troops.

(2) *Example:* Calculate the number of nonnuclear losses which will be sustained by the 102d Airborne Division on D-day and D+1. Takeoff times and H-hour are on D-day. Computations for followup echelon are omitted from this example. Strength of the division (11,486) plus augmentation (71) and attachments (14) is echeloned as follows¹:

	Strength
Assault echelon.....	10,168
Followup echelon.....	404
Rear echelon.....	999
Airhead—first day:	
Assault echelon (10,168 x 0.096).....	976

Airhead—second day:	
Assault echelon ((10,168 - 976) x 0.023).....	211
Total losses D-day and D+1 (976 + 211)...	1,187

g. Special Estimates for Amphibious Operations.

(1) Nonnuclear personnel losses for amphibious forces establishing a beachhead may be estimated by applying the applicable daily loss rates from the following table to the *assigned* strength of units actually committed in the beachhead or en route thereto.

Note. Rates in this table are for planning purposes only. The rates for each amphibious operation are different. The rates in this table are for use as a guide only or in practicing estimate procedures.

¹Division strength is based on TOE 57D and FM 57-100, appendix VI, section 11.

	1	2	3	4	5	6	7	8	9
		Phase I—Forces en route		Phase II—Forces in beachhead					
		Daily at sea ¹	Landing	First day			Succeeding days ²		
1		Nonbattle and battle casualty (percentage)	Battle casualty (percentage)	Nonbattle casualty (percentage)	Battle casualty (percentage)	Total ³ (percentage)	Nonbattle casualty (percentage)	Battle casualty (percentage)	Total ³ (percentage)
Assault forces: ⁴									
2 Divisions and attached troops.....	0.5	1.3	0.3	5.3	5.6	0.3	1.5	1.8	
3 Corps and field army troops.....	0.5	1.0	0.3	3.0	3.3	0.3	1.0	1.3	
Followup forces: ⁵									
4 Divisions and attached troops.....	0.5	0.5				0.3	1.5	1.8	
5 Corps and field army troops.....	0.5	0.5				0.3	1.0	1.3	

¹Rates in this column include both battle casualties and nonbattle casualties en route and are distributed by arm or service in the same proportion to the total losses as the strength of each arm or service is to the strength of the total force being transported.

²After beachhead is secure and forces are building up for the breakout (phase III), the rates and methods given in d(1) or e(1) above are applicable. The rates in this table are applicable only until the beachhead is firmly established.

³Losses are distributed as given in d(4) above for nonbattle casualties; d(2) or e(4) above for battle casualties by arm or service; d(2) above for battle casualties by category (killed, wounded, captured, and missing).

⁴Assault forces in this table are those units who make their landings in the face of enemy opposition at or near the beachhead. For purposes of computing total division rates, it was assumed that an assault division lands two battle groups by helicopter behind the beaches and two battle groups abreast over the beaches, followed by the reserve battle group and the remainder of the division.

⁵Followup forces in this table include those landing over beaches secured by other friendly forces.

(2) The amount and type of reinforcement required by divisions making amphibious landings will be different for each operation because of the necessity to tailor the force to fit the mission, area of operations, lift available, and the enemy situation.

(3) *Example:* Calculate the total number of nonnuclear losses which will be sustained during an amphibious operation by 1st Corps on D-1, D-day, and D+1.

	Assigned Strength
1st Infantry Division.....	13,748
2d Infantry Division.....	13,748
3d Infantry Division.....	13,748
Nondivisional troops, assault echelon.....	19,252
Nondivisional troops, followup echelon.....	33,638
Total 1st Corps.....	94,134

Total 1st Corps will sail on D-1 at assigned strength. On D-day the 1st and 2d Infantry Divisions will each assault the beach with two battle groups in helicopter assault and two battle groups abreast in a waterborne

assault. 3d Infantry Division and nondivisional troops in followup echelon will land on D+1.

D-1:

(a) *Losses at sea.*

1. Assault divisions	
27,496 x 0.5% ((1) above, col 2, line 2).....	137
2. Nondivisional assault troops	
19,252 x 0.5% ((1) above, col 2, line 3).....	96
3. Followup division	
13,748 x 0.5% ((1) above, col 2, line 4).....	69
4. Nondivisional followup troops	
33,638 x 0.5% ((1) above, col 2, line 5).....	168
5. Total 1st Corps D-1 losses.....	470

D-day:

(b) *Assault landing.*

1. Assault divisions	
(27,496 - 137) x 1.3% ((1) above, col 3, line 2).....	356
2. Nondivisional assault troops	
(19,252 - 96) x 1.0% ((1) above, col 3, line 3).....	192

(c) *Nonbattle casualties.*

1. Assault divisions	
(27,496 - 137 - 356) x 0.3% ((1) above, col 4, line 2).....	81
2. Nondivisional assault troops	
(19,252 - 96 - 192) x 0.3% ((1) above, col 4, line 3).....	57

(d) *Battle casualties.*

1. Assault divisions
(27,496 - 137 - 356) x 0.5% ((1) above,
col 5, line 2)----- 1,431
2. Nondivisional assault troops
(19,252 - 96 - 192) x 3.0% ((1) above,
col 5, line 3)----- 569

(e) *Losses at sea.*

1. Followup division
(13,748 - 69) x 0.5% ((1) above, col 2,
line 4)----- 68
2. Nondivisional followup troops
(33,638 - 168) x 0.5% ((1) above, col 2,
line 5)----- 167

(f) *Total 1st Corps D-day losses.*

(b) + (c) + (d) + (e)----- 2,921

D+1:

(g) *Landing losses.*

1. Followup division
(13,748 - 69 - 68) x 0.5% ((1) above,
col 3, line 4)----- 68

2. Nondivisional followup troops

(33,638 - 168 - 167) x 0.5% ((1) above,
col 3, line 5)----- 167

(h) *Beachhead losses.*

1. Assault divisions
(27,496 - 137 - 356 - 81 - 1,431) x
1.8% ((1) above, col 9, line 2)----- 459
2. Nondivisional assault troops
(19,252 - 96 - 192 - 57 - 569) x 1.3%
((1) above, col 9, line 3)----- 238
3. Followup division
(13,748 - 69 - 68 - 68) x 1.8% ((1)
above, col 9, line 4)----- 244
4. Nondivisional followup troops
(33,638 - 168 - 167 - 167) x 1.3% ((1)
above, col 9, line 5)----- 431

(i) *Total 1st Corps D+1 losses.*

(g) + (h)----- 1,607

(4) *Worksheet form—personnel loss estimates—amphibious operations.*

	1	2	3	4	5	6	7	8	9	10
		D-1			D-day			D+1		
		Rate (per- centage)	Strength	Losses	Rate (per- centage)	Strength	Losses	Rate (per- centage)	Strength	Losses
1	Phase I—force at sea:									
2	Assault divisions-----	0.5	27,496	137						
3	Nondivisional assault troops-----	0.5	19,252	96						
4	Followup division-----	0.5	13,748	69	0.5	13,679	68			
5	Nondivisional followup troops-----	0.5	33,638	168	0.5	33,470	167			
6	Landing:									
7	Assault divisions-----				1.3	27,359	356			
8	Nondivisional assault troops-----				1.0	19,156	192			
9	Followup division-----							0.5	13,611	68
10	Nondivisional followup troops-----							0.5	33,303	167
10	Total—Phase I-----			470			783			235
11	Phase II—forces in beach- head:									
11	Assault divisions:									
11	Nonbattle casual- ties-----				0.3	27,003	81	1.8	25,491	459
12	Battle casualties-----				5.3	27,003	1,431			

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	1	2	3	4	5	6	7	8	9	10
		D-1			D-day			D+1		
		Rate (percentage)	Strength	Losses	Rate (percentage)	Strength	Losses	Rate (percentage)	Strength	Losses
13	Nondivisional assault troops:									
14	Nonbattle casualties.....				0.3	18,964	57	1.3	18,338	238
15	Battle casualties.....				3.0	18,964	569			
16	Followup division.....							1.8	13,542	244
17	Nondivisional followup troops.....							1.3	33,136	431
17	Total—Phase II.....						2,138			1,372

2.6. Communications Zone Estimates

a. In estimating the nonnuclear gross losses for all ground troops in the communications zone, battle casualties are considered negligible, and nonbattle casualties are calculated at 0.5 percent per month. Arm or service distribution of nonbattle casualties is determined by applying this nonbattle casualty percentage to the strength of each arm or service in the command considered.

b. Before estimates of losses to nuclear weapons can be made, certain information on enemy capabilities must be secured (par. 2.3). If specific information cannot be obtained, appropriate assumptions must be made. By applying target analysis methods to selected critical target areas, a basis for estimating nuclear losses can be evolved. (See FM 101-10, part III, chapter 2, section II.)

2.7. Theater Estimates—Nonnuclear

(See FM 101-10, part III, chapter 2, section II, for theater estimates—nuclear.)

a. *General.* The following tables are based on U.S. Army experience in World War II in all theaters. Approximately 6½ percent of the losses were officers. In specific areas, the distribution of battle casualties by arm or service varies with the composition of the theater, types of operations, etc.

(1) Gross losses.

1	1	2
	Type of loss	Percentage of total theater strength per month
2	Nonbattle casualties.....	4.20
3	Battle casualties.....	4.08
	Killed.....	(0.60)
	Wounded.....	(3.00)
	Captured and Missing.....	(0.48)

(2) *Distribution of battle casualties by type and branch.*

1	1	2	3	4	5	6
	Branch	Percentage of branch's battle casualties by type				
		Killed	Wounded	Missing	Captured	Total
2	Infantry.....	17.3	71.2	2.8	8.7	100.0
3	Artillery.....	14.3	61.6	3.1	21.0	100.0
	Field.....	(15.7)	(68.0)	(2.7)	(13.6)	(100.0)
	Air defense.....	(10.5)	(43.8)	(4.1)	(41.6)	(100.0)
4	Armor.....	19.0	70.8	1.7	8.5	100.0
5	Corps of Engineers.....	18.8	66.9	2.6	11.7	100.0
6	Army Medical Service.....	15.3	66.4	2.9	15.4	100.0
7	Signal Corps.....	17.2	55.5	4.5	22.8	100.0
8	Quartermaster Corps.....	18.6	42.9	6.6	31.9	100.0
9	Ordnance Corps.....	16.1	43.4	5.7	34.8	100.0
10	Transportation Corps.....	24.1	69.2	5.9	0.8	100.0
11	Chemical Corps.....	22.7	65.3	1.3	10.7	100.0
12	Military Police Corps.....	18.1	71.6	1.3	9.0	100.0
13	Miscellaneous.....	18.8	36.8	13.6	30.8	100.0
14	Total.....	17.2	69.8	2.8	10.2	100.0

1	1	2	3	3	4	6
	Branch	Percentage of each type of battle casualty by branch				
		Killed	Wounded	Missing	Captured	Total
2	Infantry.....	80.9	82.0	79.5	68.5	80.5
3	Artillery.....	5.9	6.3	7.6	14.6	7.1
	Field.....	(4.8)	(5.1)	(4.9)	(6.9)	(5.2)
	Air defense.....	(1.1)	(1.2)	(2.7)	(7.7)	(1.9)
4	Armor.....	3.8	3.6	2.1	2.9	3.5
5	Corps of Engineers.....	4.0	3.5	3.3	4.2	3.6
6	Army Medical Service.....	2.6	2.8	2.9	4.4	2.9
7	Signal Corps.....	0.5	0.4	0.8	1.1	0.5
8	Quartermaster Corps.....	0.6	0.4	1.4	1.8	0.6
9	Ordnance Corps.....	0.4	0.2	0.8	1.4	0.4
10	Transportation Corps.....	0.2	0.1	0.3	0.0	0.1
11	Chemical Corps.....	0.6	0.4	0.2	0.4	0.4
12	Military Police Corps.....	0.2	0.2	0.1	0.1	0.2
13	Miscellaneous.....	0.3	0.1	1.0	0.6	0.2
14	Total.....	100.0	100.0	100.0	100.0	100.0

Note. Percentages for armor are composite figures grouping cavalry and armored forces operations.

b. *Estimation of Losses.*

(1) *First method.* Gross losses may be estimated by the following method, which is more accurate than (2) below because of frequent changes in organization within a theater.

(a) Determine battle casualties and non-battle casualties of combat zone troops (par. 2.5).

1. Divisional.

2. Nondivisional.

(b) Determine nonbattle casualties of

troops in the communications zone (par. 2.6).

(c) Add (a) and (b) above.

(2) *Second method.* In a well-established theater, at theater army level, losses may be estimated by the following formula:

(a) $R \times S \times T = \text{losses per month.}$

R = the daily rate of gross loss. (This is expressed as number per thousand theater army strength. It may be for total losses or for any one of the specific categories of loss; i.e., killed in action (KIA), captured or missing in action (MIA), wounded in action (WIA), etc.)

S = theater army strength in thousands.

T = 30-day net loss or return-to-duty factor, based on a gross loss rate of

one of the specified type occurring on each day of operation. (For gross loss computation, T is 30 - the number of days, since the accumulation overtime is not affected by returns to duty, evacuation, etc.)

(b) The formula in (a) above may be used to compute gross losses, net losses, or returns to duty, depending upon the T factors utilized.

(c) Losses in numbers per thousand strength per day may be converted to percentages per month by multiplying by 30 and dividing by 10 (net factor of 3).

(3) *R factors.* The R factors shown in the following table are based on World War II and Korean War experience. These factors are average daily rates per thousand theater army strength.

	1	2	3	4	5	6
	Experience	KIA	Captured or MIA	WIA ¹	Disease and nonbattle injuries ¹	Total
1	World War II:					
2	All theaters.....	0.05	0.04	0.15	1.14	1.38
3	ETO.....	0.07	0.06	0.24	0.80	1.17
4	MTO.....	0.06	0.05	0.21	1.62	1.94
5	Pacific.....	0.03	0.03	0.08	1.44	1.58
6	Korean War:					
6	FECOM.....	0.05	0.03	0.22	0.72	1.02
7	Korea.....	0.08	0.05	0.34	0.73	1.20

¹Based on admissions to hospital.

(4) *S factors.* As stated in (2)(a) above, S factors are always theater army strength in thousands. The most accurate figures available should be used. When actual assigned strengths are known or can be accurately predicted, they should be used. When actual strengths are not known or cannot be predicted, then authorized strengths should be used.

(5) *T factors.*

(a) The T factors shown in the table in (g) below are based on one of each type of loss occurring each day of operation, beginning with first day

of a period of estimate and shown for succeeding 30-day intervals of periods of estimate.

(b) *T factors for gross loss estimates* are derived by multiplying the occurrence of one each day by the number of days in the period of estimate. This, of course, always results in factors equal to the number of days in the period of estimate. Therefore, it is not necessary to show these factors separately in a table of T factors.

(c) *The return to duty from captured and missing status* are approxi-

mated by assuming that 30 percent of the personnel losses in this category during any given month are recovered for duty within the theater during the same month. Returns to duty from captured and missing status in succeeding months are indeterminable and should be disregarded in making estimates.

- (d) *T factors for monthly returns to duty within the theater from hospitals* are based on the cumulative percentage of daily returns to duty among each day's hospital admissions. For example, under a 30-day evacuation policy, 32.12 percent of each single day's battle injury and wound hospital admissions can be returned to duty within the time limit prescribed by the evacuation policy. However, at the end of 1

month of operations, 32.12 percent of only the first day's admissions have returned to duty; 31.12 percent of the second day's admissions; 30.14 percent of the third day's admissions, etc., depending upon the number of days of hospitalization that are included between the day of admission (in relation to the day of operation) and the number of days in the period of estimate. The T factors for monthly returns to duty, as shown in (g) below, and the percentages returned to duty during the month of admission and succeeding months (depending upon the length of the evacuation) are both derived in this manner. The basic data from which these figures are constructed are as follows:

Cumulative Returns to Duty From Hospital By Type of Patient

Cumulative percentages returned to duty among admissions to hospital on any 1 day of operation

1	2	3	4	5	6	7	8	9	10	11	12
Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury
1	0.00	0.00	24	26.16	76.35	47	47.27	88.24	70	61.00	91.72
2	0.89	2.60	25	27.32	77.41	48	48.05	88.44	71	61.41	91.81
3	1.83	7.33	26	28.19	78.55	49	48.88	88.87	72	61.82	91.90
4	3.11	13.41	27	29.14	79.34	50	49.56	89.01	73	62.28	92.00
5	4.54	20.17	28	30.14	80.25	51	50.35	89.11	74	62.68	92.03
6	6.04	26.87	29	31.12	80.93	52	51.05	89.26	75	63.04	92.06
7	7.53	33.05	30	32.12	82.55	53	51.64	89.40	76	63.47	92.21
8	8.85	38.88	31	33.11	83.13	54	52.36	89.63	77	63.79	92.30
9	10.15	44.18	32	34.10	83.52	55	53.03	89.75	78	64.19	92.41
10	11.39	48.64	33	35.01	84.08	56	53.64	89.92	79	64.57	92.51
11	12.37	51.77	34	36.09	84.34	57	54.22	90.13	80	64.89	92.58
12	13.34	55.37	35	36.97	84.78	58	54.83	90.21	81	65.15	92.69
13	14.30	57.35	36	37.89	85.11	59	55.53	90.33	82	65.47	92.78
14	15.45	59.95	37	38.90	85.42	60	56.05	90.59	83	65.87	92.88
15	16.52	62.36	38	39.79	85.78	61	56.55	90.70	84	66.17	92.96
16	17.66	64.72	39	40.58	86.19	62	57.15	90.73	85	66.51	93.04
17	18.69	66.63	40	41.49	86.67	63	57.64	90.82	86	66.85	93.10
18	19.78	68.24	41	42.40	86.89	64	58.22	90.95	87	67.14	93.23
19	20.99	69.65	42	43.19	87.08	65	58.71	91.04	88	67.49	93.32
20	22.07	71.35	43	44.09	87.26	66	59.19	91.15	89	67.80	93.35
21	23.19	72.72	44	44.88	87.54	67	59.63	91.27	90	68.11	93.39
22	24.18	74.04	45	45.67	87.72	68	60.03	91.43	91	68.39	93.45
23	25.18	75.24	46	46.46	88.19	69	60.53	91.54	92	68.69	93.57

1	2	3	4	5	6	7	8	9	10	11	12
Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury	Complete hospital days	Wounded in action	Disease and nonbattle injury
93	68.98	93.69	100	70.70	94.10	107	72.24	94.45	114	73.57	94.79
94	69.22	93.77	101	70.93	94.20	108	72.44	94.48	115	73.70	94.85
95	69.50	93.84	102	71.16	94.23	109	72.64	94.50	116	73.89	94.89
96	69.70	93.92	103	71.36	94.27	110	72.87	94.54	117	74.04	94.93
97	69.99	93.96	104	71.61	94.31	111	73.03	94.66	118	74.17	95.01
98	70.24	94.01	105	71.83	94.36	112	73.20	94.70	119	74.37	95.04
99	70.48	94.06	106	72.05	94.40	113	73.41	94.74	120	74.55	95.08

(e) Limited assignment personnel. Of the personnel who return to duty within the theater from hospitals, the following percentages are limited assignment:

1. Under 30-day or 60-day evacuation policies:

- (a) 8 percent of battle casualties.
- (b) 5 percent of the nonbattle casualties.

2. Under 90-day or 120-day evacuation policies:

- (a) 28.6 percent of the battle casualties.
- (b) 5.3 percent of the nonbattle casualties.

(f) *T factors for monthly net losses* are determined by subtracting the returns to duty corresponding to the evacuation policy considered from the gross losses. The sum of the returns to duty and net losses for any month, therefore, must always equal 30.

(g) *T factors for use in computing*

theater net losses and returns to duty are included in the following table. It will be noted that the respective monthly factor is constant after a number of days equal to the length of the evacuation policy considered *plus 30 days*. For example, under a 30-day evacuation policy, the monthly factors are the same from the second month (60 days) and for each succeeding month thereafter, under a 60-day evacuation policy, the monthly factors are the same beginning with the third month (90 days); under a 90-day evacuation policy, they are the same beginning with the fourth month (120 days), etc. Therefore, cumulative factors for 30-day intervals may be determined for any period of estimate beyond the length of the evacuation policy by adding the required number of constant factors to the cumulative figure shown for the period equal to the length of the evacuation policy.

	1	Cumulative							Monthly						
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Type of loss	30 days	60 days	90 days	120 days	150 days	180 days	360 days	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	331-360 days
2	Killed in action-----	30.00	60.00	90.00	120.00	150.00	180.00	360.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
3	Captured and missing:														
	a. Net loss-----	21.00	42.00	63.00	84.00	105.00	126.00	252.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00
	b. Return to duty-----	9.00	18.00	27.00	36.00	45.00	54.00	108.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

1. 120-day evacuation policy.

4	Wounded in action:														
	a. Net loss-----	24.98	41.31	52.44	60.91	68.54	76.17	121.95	24.98	16.33	11.13	8.47	7.63	7.63	7.63
	b. Return to duty-----	5.02	18.69	37.56	59.09	81.46	103.83	238.05	5.02	13.67	18.87	21.43	22.37	22.37	22.37
5	Disease and nonbattle injury:														
	a. Net loss-----	13.60	17.33	19.69	21.38	22.86	24.34	33.22	13.60	3.73	2.36	1.69	1.48	1.48	1.48
	b. Return to duty-----	16.40	42.67	70.31	98.62	127.14	155.66	326.78	16.40	26.27	27.64	28.31	28.52	28.52	28.52

2. 90-day evacuation policy.

4	Wounded in action:														
	a. Net loss-----	24.98	41.31	52.44	62.01	71.58	81.15	138.57	24.98	16.33	11.13	9.57	9.57	9.57	9.57
	b. Return to duty-----	5.02	18.69	37.56	57.99	78.42	98.85	221.43	5.02	13.67	18.87	20.43	20.43	20.43	20.43
5	Disease and nonbattle injury:														
	a. Net loss-----	13.60	17.33	19.69	21.67	23.65	25.63	37.51	13.60	3.73	2.36	1.98	1.98	1.98	1.98
	b. Return to duty-----	16.40	42.67	70.31	98.33	126.35	154.37	322.49	16.40	26.27	27.64	28.02	28.02	28.02	28.02

3. 60-day evacuation policy.

4	Wounded in action:														
	a. Net loss-----	24.98	41.31	54.50	67.69	80.88	94.07	173.21	24.98	16.33	13.19	13.19	13.19	13.19	13.19
	b. Return to duty-----	5.02	18.69	35.50	52.31	69.12	85.93	186.79	5.02	13.67	16.81	16.81	16.81	16.81	16.81
5	Disease and nonbattle injury:														
	a. Net loss-----	13.60	17.33	20.15	22.97	25.79	28.61	45.53	13.60	3.73	2.82	2.82	2.82	2.82	2.82
	b. Return to duty-----	16.40	42.67	69.85	97.03	124.21	151.39	314.47	16.40	26.27	27.18	27.18	27.18	27.18	27.18

4. 30-day evacuation policy.

4	Wounded in action:														
	a. Net loss-----	24.98	45.34	65.70	86.06	106.42	126.78	248.94	24.98	20.36	20.36	20.36	20.36	20.36	20.36
	b. Return to duty-----	5.02	14.66	24.30	33.94	43.58	53.22	111.06	5.02	9.64	9.64	9.64	9.64	9.64	9.64
5	Disease and nonbattle injury:														
	a. Net loss-----	13.60	18.83	24.06	29.29	34.52	39.75	71.13	13.60	5.23	5.23	5.23	5.23	5.23	5.23
	b. Return to duty-----	16.40	41.17	65.94	90.71	115.48	140.25	288.87	16.40	24.77	24.77	24.77	24.77	24.77	24.77

(6) *Computations.* To obtain gross losses, the planner first multiplies the respective expected daily rate of loss per thousand strength (R) by the theater army strength (in thousands) (S) to obtain the respective number of gross losses each day. This number is then multiplied by the number of days in the period of estimate (T) to obtain the gross losses for the entire period of estimate. When the gross losses, regardless of type, are desired, it is necessary only to multiply the sum of the respective R factors by the strength (S) and length of period of estimate (T). However, *net losses* and *returns to duty* must be computed separately for each type of casualty, using the respective R and T factors applicable to the type of loss and to the *evacuation policy considered*. Examples of the estimation of losses for the next 60 days by the formula $R \times S \times T$ for a theater with an Army strength of 500,000, a 60-day evacuation policy, and theater daily rates as shown for European Theater of Operations in World War II ((3) above) are as follows:

(a) *Gross losses.*

Type of loss	Cumulative for 60 days
1. KIA $(0.07 \times 500 \times 60) =$	2,100
Captured or	
MIA $(0.06 \times 500 \times 60) =$	1,800
WIA $(0.24 \times 500 \times 60) =$	7,200
Disease and non-battle injury $(0.80 \times 500 \times 60) =$	24,000
Total $(1.17 \times 500 \times 60) =$	35,100
Type of loss	Total for each 30 days
2. KIA $(0.07 \times 500 \times 30) =$	1,050
Captured or	
MIA $(0.06 \times 500 \times 30) =$	900
WIA $(0.24 \times 500 \times 30) =$	3,600
Disease and non-battle injury $(0.80 \times 500 \times 30) =$	12,000
Total $(1.17 \times 500 \times 30) =$	17,550

3. It will be noted that only the last lines of the above two computations are necessary when the gross losses only, regardless of type, are required.

(b) *Returns to duty within the theater.*

Type of loss	Cumulative for 60 days
1. Captured or	
MIA $(0.06 \times 500 \times 18.00) =$	540
WIA $(0.24 \times 500 \times 18.69) =$	2,243
Disease and non-battle injury $(0.80 \times 500 \times 42.67) =$	17,068
Total -----	19,851

Type of loss	First 30 days
2. Captured or	
MIA $(0.06 \times 500 \times 9.00) =$	270
WIA $(0.24 \times 500 \times 5.02) =$	602
Disease and non-battle injury $(0.80 \times 500 \times 16.40) =$	6,560
Total -----	7,432

Type of loss	Second 30 days
3. Captured or	
MIA $(0.06 \times 500 \times 9.00) =$	270
WIA $(0.24 \times 500 \times 13.67) =$	1,641
Disease and non-battle injury $(0.80 \times 500 \times 26.27) =$	10,508
Total -----	12,419

(c) *Net losses.*

Type of loss	Cumulative for 60 days
1. KIA $(0.07 \times 500 \times 60.00) =$	2,100
Captured or	
MIA $(0.06 \times 500 \times 42.00) =$	1,260
WIA $(0.24 \times 500 \times 41.31) =$	4,957
Disease and non-battle injury $(0.80 \times 500 \times 17.33) =$	6,932
Total -----	15,249
Type of loss	First 30 days
2. KIA $(0.07 \times 500 \times 30.00) =$	1,050
Captured or	
MIA $(0.06 \times 500 \times 21.00) =$	630
WIA $(0.24 \times 500 \times 24.98) =$	2,998

Disease
and non-
battle in-
jury $(0.80 \times 500 \times 13.60) = 5,440$

Total ----- 10,118

	Type of loss	Second 30 days
3. KIA	$(0.07 \times 500 \times 30.00) =$	1,050
Captured or		
MIA	$(0.06 \times 500 \times 21.00) =$	630
WIA	$(0.24 \times 500 \times 16.33) =$	1,959
Disease		
and non-		
battle in-		
jury	$(0.80 \times 500 \times 3.73) =$	1,492
Total	-----	5,131

(7) In addition to the losses enumerated in (3), (5)(g), and (6) above, certain additional patients are treated on an excused-from-duty basis and, unless later evacuated to hospitals, are not dropped from the rolls of their units. These patients are classified as *quarters cases* and usually are treated at aid stations or collecting stations, in the division clearing company, or in some other medical treatment facility forward of hospitals. Although the majority of these patients are excused from duty for comparatively short periods of time, nevertheless, the planner should be aware of their potential loss under certain conditions where retention in forward elements may either be impracticable or undesirable.

(a) For estimation purposes, about one-third of disease and nonbattle injury admissions to all medical treatment facilities and about one-tenth of battle injury and wound admissions may be expected to remain under treatment in medical treatment facilities forward of hospitals if there is no interference with the

primary mission of reception, treatment, and evacuation of casualties.

(b) Factors which may be applied to the number of *gross losses* based on hospital admissions, separately for wounded in action patients and for disease and nonbattle injury patients, to derive the expected number of quarters cases are as follows:

1. Wounded in action-----0.1111.
2. Disease and nonbattle injury -----0.4925.

(c) Basic data showing the cumulative percentage returned to duty each day among admissions to quarters on any 1 day of operation are as follows:

1	2	3	4	5	6
Complete quarters (days)	Cumulative percentage return to duty		Complete quarters (days)	Cumulative percentage return to duty	
	WIA	Disease and nonbattle injury		WIA	Disease and nonbattle injury
1	0.00	0.00	16	90.24	99.21
2	20.92	20.83	17	91.02	99.33
3	41.35	48.03	18	91.59	99.44
4	57.36	68.77	19	92.09	99.53
5	66.97	80.84	20	92.52	99.61
6	73.73	88.35	21	92.88	99.68
7	77.50	92.06	22	93.17	99.75
8	79.85	94.62	23	93.46	99.81
9	81.91	96.05	24	93.67	99.86
10	83.97	96.99	25	93.81	99.89
11	84.97	97.32	26	93.88	99.91
12	86.11	97.96	27	93.95	99.93
13	87.25	98.52	28	94.02	99.94
14	88.39	98.86	29	94.02	99.95
15	89.46	99.09	30 and over	94.09	99.95

(d) Based on the above data, T factors for use in computing net losses and returns to duty for quarters cases are included in the following table:

Cumulative					Monthly			
1	2	3	4	5	6	7	8	9
Type of quarters case and disposition	30 days	60 days	90 days	180 days	1-30 days	31-60 days	61-90 days	151-180 days
<i>1. 30-day or longer evacuation policy.</i>								
2 Wounded in action:								
a. Net loss.....	5.86	7.63	9.40	14.71	5.86	1.77	1.77	1.77
b. Return to duty.....	24.14	52.37	80.60	165.29	24.14	28.23	28.23	28.23
3 Disease and nonbattle injury:								
a. Net loss.....	3.26	3.28	3.30	3.36	3.26	0.02	0.02	0.02
b. Return to duty.....	26.74	56.72	86.70	176.64	26.74	29.98	29.98	29.98
<i>2. 20-day evacuation policy.</i>								
2 Wounded in action:								
a. Net loss.....	5.98	8.23	10.48	17.23	5.98	2.25	2.25	2.25
b. Return to duty.....	24.02	51.77	79.52	162.77	24.02	27.75	27.75	27.75
3 Disease and nonbattle injury:								
a. Net loss.....	3.28	3.39	3.50	3.83	3.28	0.11	0.11	0.11
b. Return to duty.....	26.72	56.61	86.50	176.17	26.72	29.89	29.89	29.89
<i>3. 15-day evacuation policy.</i>								
2 Wounded in action:								
a. Net loss.....	6.38	9.54	12.70	22.18	6.38	3.16	3.16	3.16
b. Return to duty.....	23.62	50.46	77.30	157.82	23.62	26.84	26.84	26.84
3 Disease and nonbattle injury:								
a. Net loss.....	3.35	3.62	3.89	4.70	3.35	0.27	0.27	0.27
b. Return to duty.....	26.65	56.38	86.11	175.30	26.65	29.73	29.73	29.73
<i>4. 10-day evacuation policy.</i>								
2 Wounded in action:								
a. Net loss.....	7.37	12.18	16.99	31.42	7.37	4.81	4.81	4.81
b. Return to duty.....	22.63	47.82	73.01	148.58	22.63	25.19	25.19	25.19
3 Disease and nonbattle injury:								
a. Net loss.....	3.74	4.64	5.54	8.24	3.74	0.90	0.90	0.90
b. Return to duty.....	26.26	55.36	84.46	171.76	26.26	29.10	29.10	29.10
<i>5. 5-day evacuation policy.</i>								
2 Wounded in action:								
a. Net loss.....	11.39	21.30	31.21	60.94	11.39	9.91	9.91	9.91
b. Return to duty.....	18.61	38.70	58.79	119.06	18.61	20.09	20.09	20.09
3 Disease and nonbattle injury:								
a. Net loss.....	7.60	13.34	19.08	36.30	7.60	5.74	5.74	5.74
b. Return to duty.....	22.40	46.66	70.92	143.70	22.40	24.26	24.26	24.26

(e) Since T factors for quarters cases are based on a daily admission to quarters of *one* patient per day, it is necessary to divide the gross loss numbers ((b) above) by the number of days in the estimate prior to

multiplication by T factors for quarters cases.

(8) Assuming that quarters patients cannot be retained on an excused-from-duty basis in forward elements of the command, additional losses (based on

data included in ((6) above) can be determined as follows:

(a) *Additional gross losses (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA (7,200 × 0.1111) =	800
Disease and nonbattle injury (24,000 × 0.4925) =	11,820
Total -----	12,620
Type of loss	Total for each 30 days
2. WIA (3,600 × 0.1111) =	400
Disease and nonbattle injury (12,000 × 0.4925) =	5,910
Total -----	6,310

(b) *Returns to duty (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA (800 ÷ 60 × 52.37) =	698
Disease and nonbattle injury (11,820 ÷ 60 × 56.72) =	11,174
Total -----	11,872

Type of loss	First 30 days
2. WIA (400 ÷ 30 × 24.14) =	322
Disease and nonbattle injury (5,910 ÷ 30 × 26.74) =	5,268
Total -----	5,590
Type of loss	Second 30 days
3. WIA (400 ÷ 30 × 28.23) =	376
Disease and nonbattle injury (5,910 ÷ 30 × 29.98) =	5,906
Total -----	6,282

(c) *Net losses (quarters cases).*

Type of loss	Cumulative for 60 days
1. WIA (800 ÷ 60 × 7.63) =	102
Disease and nonbattle injury (11,820 ÷ 60 × 3.28) =	646
Total -----	748
Type of loss	First 30 days
2. WIA (400 ÷ 30 × 5.86) =	78
Disease and nonbattle injury (5,910 ÷ 30 × 3.26) =	642
Total -----	720
Type of loss	Second 30 days
3. WIA (400 ÷ 30 × 1.77) =	24
Disease and nonbattle injury (5,910 ÷ 30 × 0.02) =	4
Total -----	28

Section III. PRISONER OF WAR CAPTURE RATES

2.8. General

In order that the necessary arrangements may be made for the reception, care, and disposition of prisoners of war, it will be necessary to estimate the number of prisoners that probably will be captured over a period of time or for a specific operation. Factors to be considered in preparing such an estimate include the following:

- Enemy morale.
- Avenues of withdrawal open to the enemy.
- Ability of friendly forces to encircle or cut off enemy units.

d. Type of warfare in which forces are engaged; that is, position warfare, war of movement, etc.

e. Relative strength of opposing forces.

f. Intensity and effectiveness of friendly psychological warfare.

g. Effectiveness of ideological indoctrination of enemy troops.

2.9. Division and Corps Estimate

a. *Equal Force Estimates.* When the opposing forces are approximately equal in number, the average number of prisoners expected to be

taken can be estimated by using the following factors:

Troops	Percentage per month of strength
Armored divisions -----	0.8
Infantry divisions -----	1.35
Corps and field army nondivisional units ----	Negl

b. Unequal Force Estimates. For estimates by divisions (or task forces) and corps, the following figures are averages, based on experiences of some U.S. divisions against veteran troops in World War II. In these instances, U.S. forces were numerically superior by about 2 to 1—

By a division in attack of a defense position-----	50 per day.
By a division in attack of a defensive position preceded by night approach and with complete surprise obtained-----	700 per day.
By an armored task force in an encirclement operation -----	1,000 per day.
By a division in defense of a position against an unsuccessful attack -----	300 per day.
(Expressed as an average number of prisoners per division per day.)-----	47 per day.

2.10. Theater Estimates

a. For overall estimates on a theater level under nonnuclear conditions, the factors in the following table may be used.

Prisoner of War Capture Rates¹

	1	2	3	4	5
	Prisoners of war per month				
1	Organization	De- fense	Offense	Capitulation	
				First month	Succeed- ing month
2	Inf div (TOE 7D)----	230	3,500	6,000	30,000
3	Armd div (TOE 17D)---	117	3,600	6,000	30,000
4	Abn div (TOE 57D)--	155	2,550	6,000	30,000

¹ Prisoner of war capture rates do not include civilian internees.

b. Since prisoners are not captured at a uniform rate, special preparations must be made for the reception of unusual numbers when theater plans contemplate decisive action, such as cutting routes of withdrawal or driving the enemy against an obstacle.

c. An accurate method of estimating prisoner of war capture rates under conditions of nuclear or chemical, biological, and radiological warfare has not been determined. However, using target analysis methods, enemy casualties can be estimated and assumptions made of the number of enemy casualties remaining in the area which will be subject to capture in the exploitation phase.

Section IV. PERSONNEL SERVICES

2.11. General

The data presented in paragraphs 2.12 and 2.13 are intended for planning purposes only and do not represent doctrine. The figures have been compiled from the experience of the European Theater of Operations in World War II and the Korean War by averaging the experience of several units over several periods of time. The figures are based on the needs per month of 10,000 troops.

2.12. Decorations

	Approximate average
Distinguished Service Cross -----	9
Distinguished Service Medal -----	1
Silver Star -----	103
Legion of Merit -----	20
Distinguished Flying Cross -----	6
Soldier's Medal -----	7
Bronze Star -----	565
Heroism -----	(270)
Meritorious Achievement -----	(295)
Air Medal -----	85
Commendation Ribbon -----	485
Purple Heart -----	1,175

2.13. Mail

	<i>Pieces</i>	<i>Weight in pounds</i>	<i>MTON of shipping space</i>
<i>a. Wartime.</i>			
(1) <i>Surface.</i>			
(a) Incoming (to the theater)— Third- and fourth-class mail	26,650	49,754	155.481
(b) <i>Outgoing</i> — Third- and fourth-class mail	1,436	2,675	8.328
(2) <i>Air.</i>			
(a) Incoming— Airmail ----- First-class mail -----	265,083 97,450	6,165 2,256	17.614 6.429
(b) <i>Outgoing</i> — Airmail ----- First-class mail -----	205,549 54,973	4,757 1,270	13.591 3.629
<i>b. Peacetime.</i>			
(1) <i>Surface.</i>			
(a) Incoming to the theater)— First-class mail ----- Other -----	199,010 10,910	5,763 43,453	16.466 135.791
(b) <i>Outgoing</i> — First-class mail ----- Other -----	52,250 12,480	1,075 47,926	3.071 149.769
(2) <i>Air.</i>			
(a) Incoming— Airmail ----- First-class mail ----- Parcel post -----	148,183 82,830 870	4,306 3,765 3,187	12.303 10.757 9.959
(b) <i>Outgoing</i> — Airmail ----- First-class mail ----- Parcel post -----	261,018 47,234 975	5,118 1,243 3,656	14.623 3.551 11.425

Section V. INTERNAL ARRANGEMENT OF HEADQUARTERS

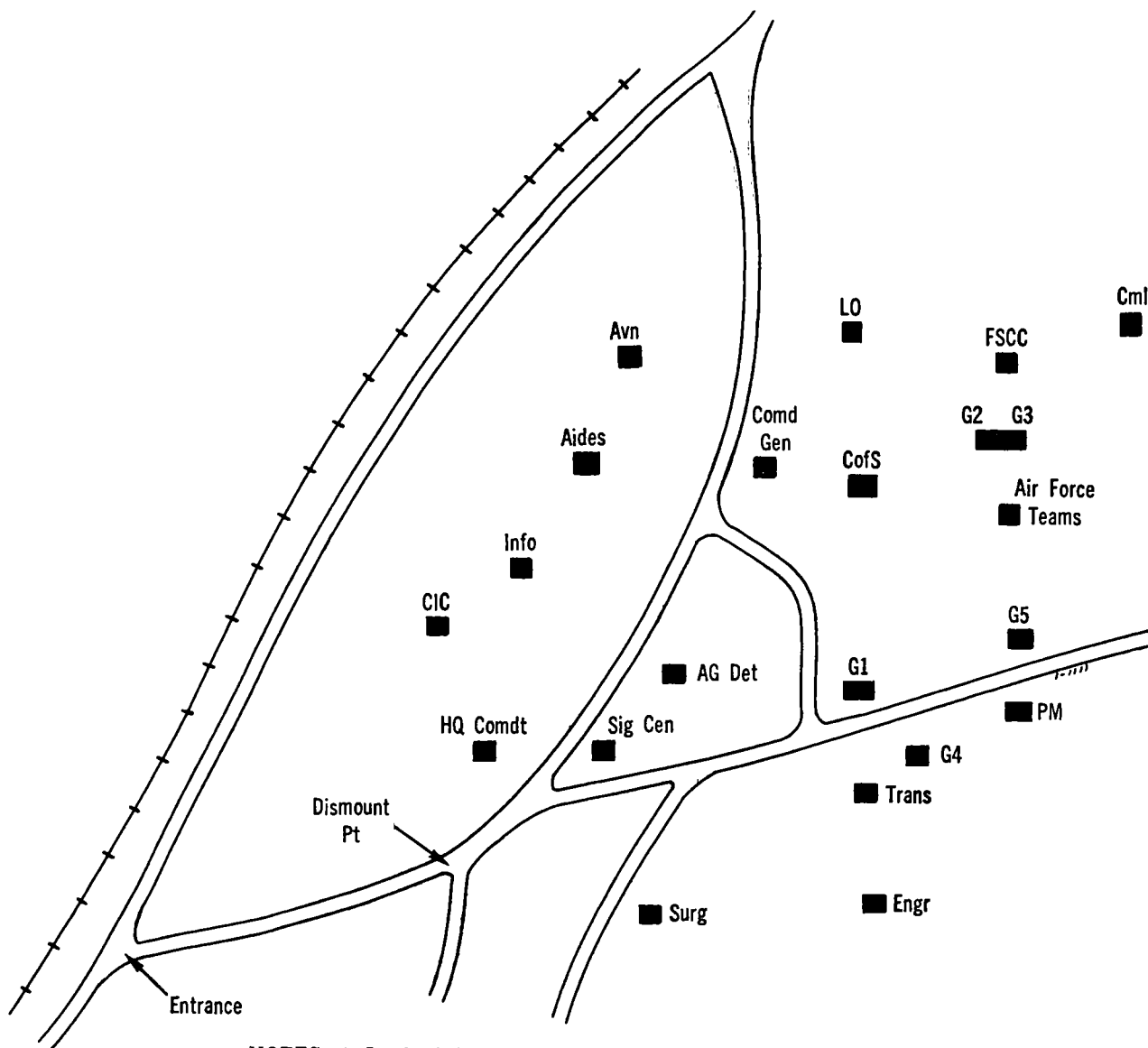
2.14. General

The following diagrams indicate schematic arrangements for field army, corps, and division headquarters. The echelons of field army, corps,

and division headquarters may be located in buildings. The diagrams which are shown for these headquarters suggest a layout to be followed when they operate under tentage.

2.15. Division Headquarters (Schematic)

a. Main Command Post.



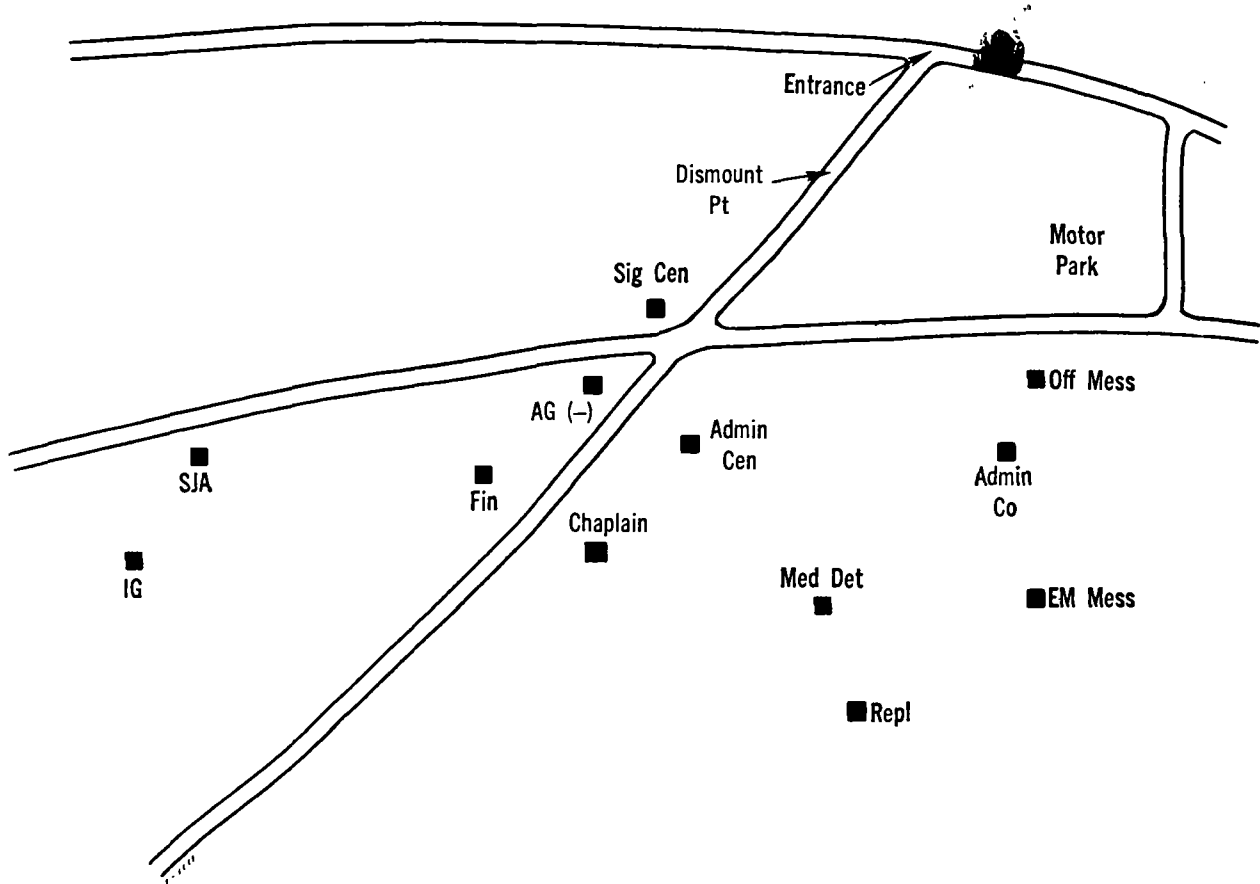
NOTES: 1. In the infantry division, the brigade command post is established by the brigade headquarters section under the command of the assistant division commander. It normally operates in one echelon in the vicinity of one of the area signal centers and, at a sufficient distance from the main command post to preclude destruction of both headquarters by a single weapon.

2. In the airborne division, modifications will be effected because of organization and mission.

3. While not part of the main command post, sufficient area also must be provided for a motor park, messes, elements of headquarters company, the military police detachment, and helicopter landing zone and/or airstrip.

4. Elements of the main command post may be located in a forward command post.

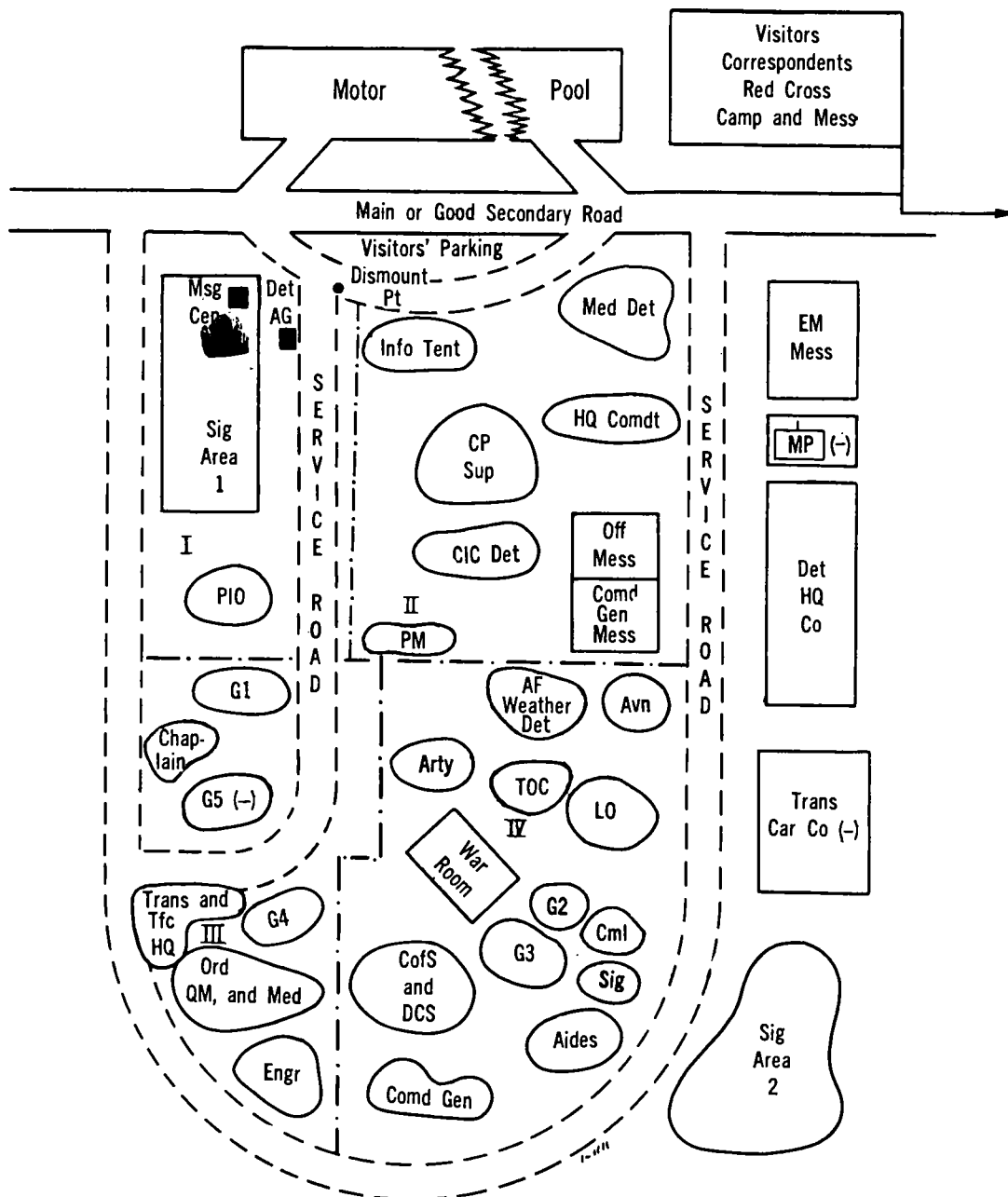
b. Rear Command Post (not to scale).



NOTE: Rear command post may be located outside the division area.

2.16. Corps Headquarters

a. Main Command Post (not to scale).

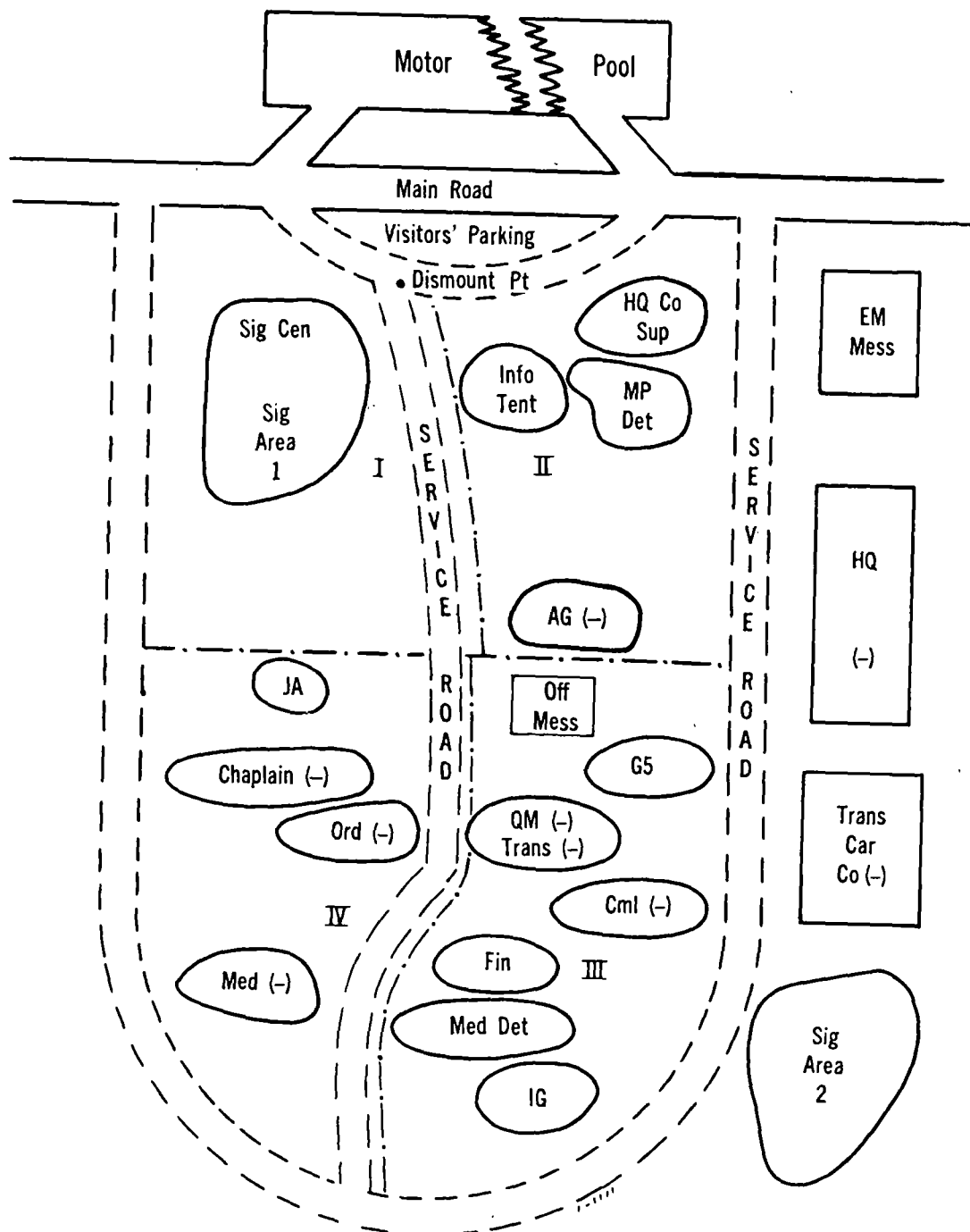


Relative locations of sections at corps main command post

NOTES: 1. Notice that the total area occupied is divided into four areas. Various sections should endeavor to retain their relative positions within their respective areas.

2. Elements of main command post may be located in a forward command post.

b. Rear Command Post (not to scale).

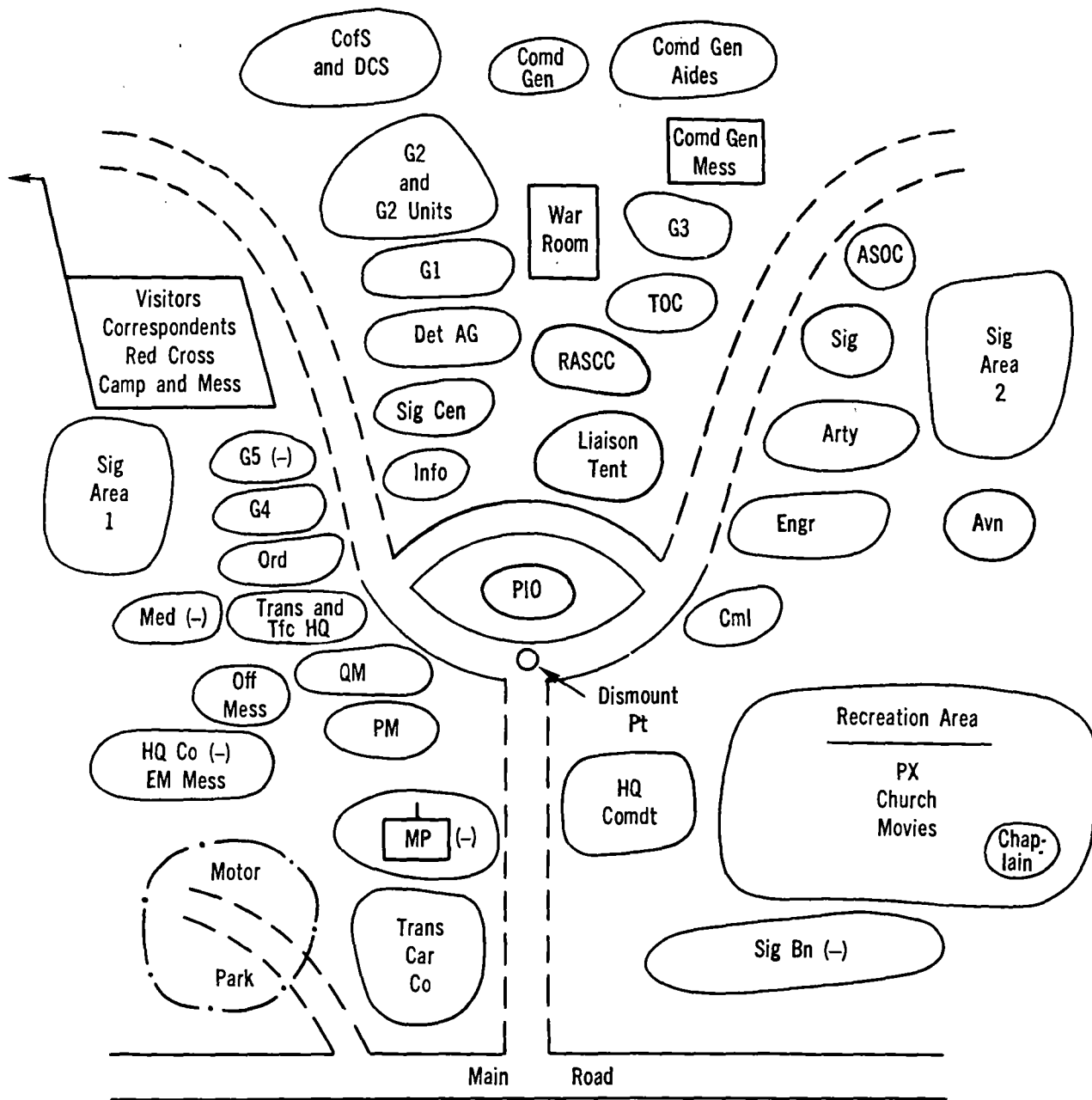


Relative locations of sections at corps rear command post

NOTE: Notice that the total area is divided into four areas. Various sections should endeavor to retain their relative positions within their respective areas.

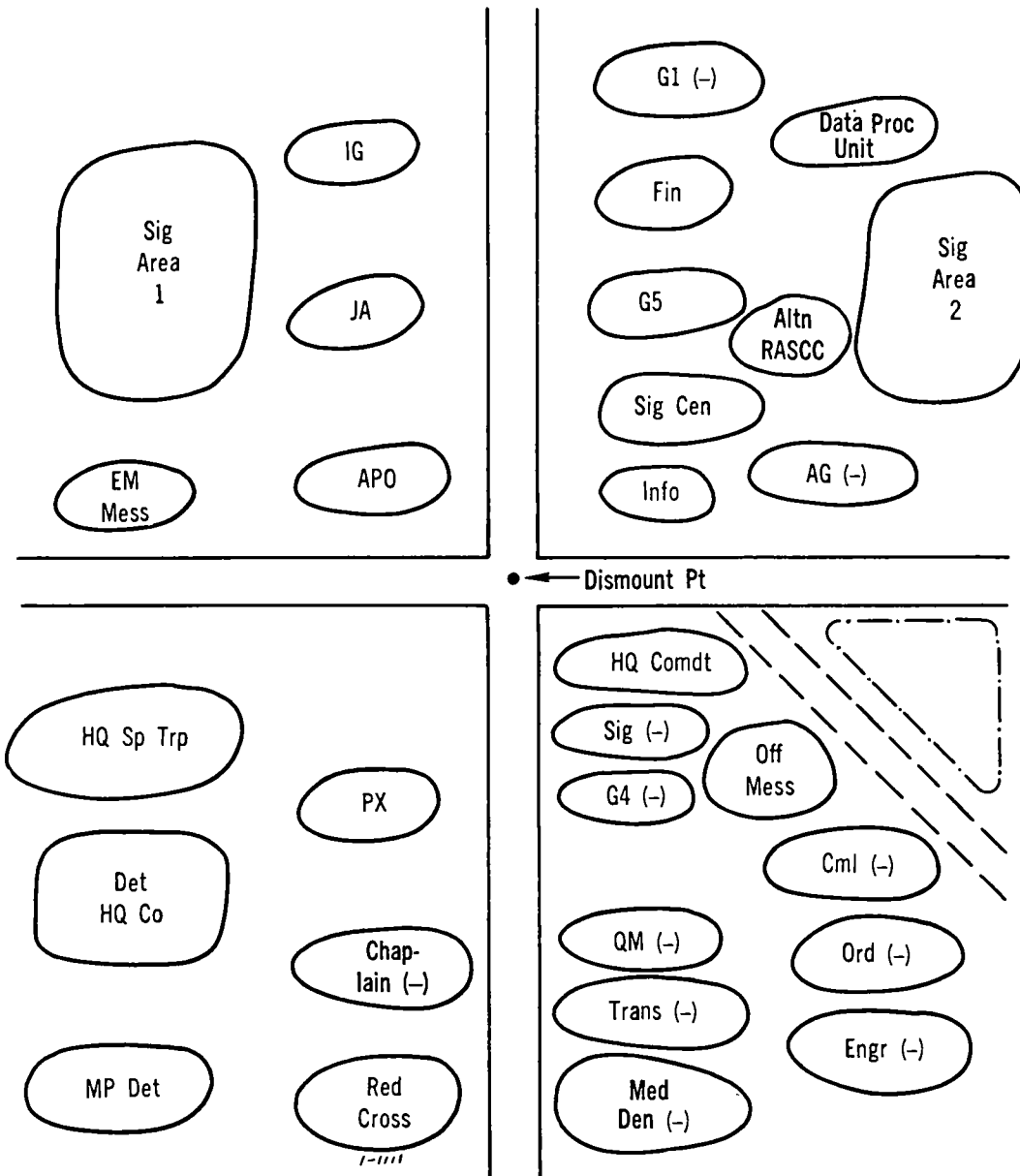
2.17. Field Army Headquarters

a. *Main Command Post (not to scale).*



NOTE: Elements of the main command post may be located in a forward command post.

b. Rear Command Post (not to scale).



INTELL
MAPS
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1

CHAPTER 3

INTELLIGENCE—MAPPING AND AERIAL PHOTOGRAPHY

Section I. GENERAL

3.1. Intelligence

The mission of the military intelligence organization is to provide intelligence specialist support to major commanders from division to theater army level to assist in the production of intelligence. The military intelligence organization is composed of trained military intelligence, counterintelligence, and field operations intelligence personnel, along with necessary administrative and technical personnel. For detailed data concerning organizational concept and intelligence planning, see FM 30-9 and 30-9A; FM 101-10, part III, and TOE 30-25 (when published). Special intelligence units and detachments (military intelligence organization) are presented in paragraph 4.2e(8).

3.2. Mapping and Aerial Photography

Mapping and aerial photography are intelligence items. The following sections in this chapter provide basic data on responsibilities and factors for the estimation of various logistical needs in connection with these items. This information is for general planning only. The specific problem of providing map support for an operation should be coordinated with the engineer of the planning echelon.

3.3. Functions and Responsibilities

Functions and responsibilities with respect to mapping and aerial photography are given in AR 117-5.

Section II. MAPPING

3.4. Types and Scales of Military Maps

a. Types.

- (1) *Planimetric map.* A map which presents the horizontal positions only of the features represented.
- (2) *Topographic map.* A map which presents the horizontal and vertical positions of the features represented.
- (3) *Plastic relief map.* A topographic map printed on plastic and molded into three-dimensional form.
- (4) *Photomap.* A reproduction of a photograph or photomosaic upon which gridlines, marginal data, place names, and boundaries are added and which, in some instances, depicts relief graphically.
- (5) *Plastic relief photomap.* A photomap printed on plastic and molded into three-dimensional form.
- (6) *Military city map.* A large-scale topo-

graphic map (usually 1:12,500) of a town or city.

- (7) *Special maps.* Maps designed for a special purpose, such as trafficability maps, transportation maps, boundary maps, etc.
- (8) *Terrain model.* A three-dimensional representation of an area, modeled in plaster, sponge rubber, or other materials. It is distinguished from other map types in that some cultural and terrain features are shown in realistic model form rather than by topographic symbol.
- (9) *Photomosaic.* Assembly of aerial photographs to form a composite picture.

b. Scales.

- (1) *Small-scale military maps* range in scale from 1:600,000 to smaller (1:1,000,000 is standard). These scales of maps are needed for general

planning and for strategic studies by commanders of large units.

- (2) *Medium-scale military maps* range in scale from 1:600,000 to 1:75,000 (1:250,000 is standard). These scales of maps are required for planning operations, including movements and concentrations of troops and supplies. They are used as detailed planning maps, as graphics to illustrate briefings, as bases for medium-scale plastic relief maps, as road maps, and for phases of close air-ground support. When no larger scales are available, they are used as tactical maps and to assist field artillery in fire control.
- (3) *Large-scale military maps* range in scales from 1:75,000 to larger (1:50,000 is standard). These scales of maps are intended to meet the tactical, technical, and administrative needs of field units.

3.5. Requirements for Maps

a. *General.* To calculate quantities of maps required for an operation, the following must be determined:

- (1) The number of sheets of each map scale (i.e., the area coverage required at each scale). Data must be obtained from map indexes of the area concerned.
- (2) The number of copies of each sheet required for initial issue. Data are in *b* below.
- (3) The number of copies of each sheet required for replenishment issues. Data are in *c* below.
- (4) The total copies of each scale required. This total equals sheets X initial copies + replenishment.

b. *Copies for Initial Issue.*

- (1) *Guides for estimating quantities.*

(a) *General.* Small- and medium-scale maps (other than road maps) and aeronautical charts are issued in small quantities to headquarters only. The basis of issue is the unit

headquarters, and quantities vary in proportion to the size of the unit. Basic figures are given in table showing headquarters allowances ((g) below).

(b) *Large-scale maps.*

1. *General.* Bases used in computing allowances of large-scale maps vary with the type of the unit. The company is the basic unit for computing large-scale map requirements. Headquarters and service companies use the same bases as other companies. Allowances for unit headquarters are given in (g) below. In addition, an allowance of one copy per organic Army aircraft is made.
2. *Infantry and combat engineer units.* Allowances for infantry and combat engineer units are on the basis of two copies per platoon.
3. *Artillery units.* Allowances for headquarters and service batteries are the same as for infantry units. Allowances for firing batteries are on the basis of one per section plus two per forward observer and liaison officer.
4. *Armored units.* Allowances for armored units are computed on the same basis as infantry units plus an additional allowance of one per tank and carriage and two per armored personnel carrier with armament.
5. *Airborne units.* Allowances for airborne units are the same as for equivalent ground troops.
6. *Other units.* Map requirements for other units are on the basis of one per officer and one per reconnaissance noncommissioned officer.

(c) *Road maps.* Road maps are issued one per vehicle and in limited quantities to unit headquarters.

- (d) *Aeronautical charts.* In addition to the headquarters allowances, aeronautical charts are issued on a basis of two per organic Army aircraft.
- (e) *Photomaps.* Photomaps are issued as substitutes for large-scale maps when the latter are not available. When necessary as supplements to topographic maps, photomaps are issued in quantities not exceeding those authorized for topographic

maps.

- (f) *Hydrographic charts.* Hydrographic charts are issued to units and headquarters as required by the situation and the mission of the unit.

- (g) *Headquarters.* In addition to the guides stated above, the quantities shown in the following table are the number of copies of each sheet needed by unit headquarters.

Headquarters Allowances

	1	2	3	4	5	6
	Unit	Small-scale maps	Medium-scale maps	Large-scale maps	Road maps	Aeronautical charts ¹
2	Field army HQ-----	25	75	50	75	50
3	Corps HQ-----	15	40	75	50	25
4	Div HQ-----	5	25	55	50	10
5	BG HQ-----	1	7	² 14	15	3
6	Bn HQ-----	0	3	² 12	5	0
7	Co HQ-----	0	1	(³)	1	0

¹ Add one per organic aircraft.

² BG and bn needs for service units are 50 percent of those for combat units.

³ 50 percent of the needs for combat co in (b) above, or one copy per co, whose needs are based on officer strength.

- (2) *Summary of totals.* (Numbers given are number of copies of each different sheet for initial issue for average oper-

ations and include a small reserve to be held under unit control.)

	1	2	3	4	5	6
	Unit	Small-scale maps ¹	Medium-scale maps ¹	Large-scale maps ¹	Road maps	Aeronautical charts ²
2	Fld army HQ and all fld army non-divisional troops-----	50	600	1,500	4,500	200
3	Corps HQ and all corps nondivisional troops-----	40	600	1,500	3,000	100
4	Inf div-----	25	250	1,190	2,750	150
5	Armd div-----	8	200	1,650	3,650	150
6	Abn div-----	8	150	³ 1,000	2,100	140

¹ Number of plastic relief maps not included.

² Production and distribution are Air Force responsibilities. Normally, Air Force distribution to troops is in bulk to CONUS and theater army logistical command map depots; and the engineer makes detailed distribution.

³ Is 1,500 for airborne operations.

c. *Replenishment Requirements.* The following percentages refer to quantities a field army requires under its control (in addition to the initial issue) in field army map depots:

Small scale--100% of initial requirements
Medium scale--100% of initial requirements
Large scale-- 50% of initial requirements

d. Overall Planning Factors.

Initial issue—

Field army 2,700,000 sheets—135 tons

Corps 420,000 sheets—21 tons

Replenishment—

Field army 180,000 sheets/

day ————— 9 tons/day

e. Map Coverage.

Ground Coverage by Scale ¹

1	1	2	3	4	5
	Scale	Miles N-S	Miles E-W	Square miles	1 inch= aprx (mi)
2	1:1,000,000-----	276.0	318.0	88,000	16.0
3	1:250,000-----	70.0	100.0	7,000	4.0
4	1:100,000-----	35.0	25.0	875	1.6
5	1:50,000-----	17.0	14.0	238	0.8
6	1:25,000-----	8.5	6.5	55	0.4

¹ Average figures are given for approximately 40° north latitude.

f. Typical Planning Procedure. Field army G2 confers with the G3 to determine the types and scales of maps to be used by subordinate units and field army headquarters. An operational map is selected for use by field army and corps headquarters so that all orders, overlays, and references will be based on the same map. The field army engineer attends these staff conferences to advise on the availability of maps in field army and base map depots, capacity of reproduction facilities, and types and scales which can be most readily reproduced. The G3 outlines the area for which map coverage is desired. This area will be well in advance of the present friendly forward dispositions of the field army because of the time required for procurement, production, reproduction, and distribution of maps. In addition, maps of the future area of operations are required early for planning purposes. The G3 also outlines tentative future dispositions, direction of attack, and boundaries of field army and subordinate units. This tentative information will be used by the engineer in determining map requirements for the field army. The procedure is as follows:

- (1) Lay out the projected field army area for which coverage is desired on the pertinent index map.

- (2) In the field army area outlined on the index map, lay out the tentative corps and division boundaries. Project these boundaries to cover the entire area for which map coverage is desired. While these projected boundaries will change during the campaign, divisions and corps of the field army will operate in the area. Therefore, calculations based on one pattern of operations are valid for map procurement purposes.

- (3) List the units requiring each map sheet. Divisions in reserve will require map sheets of the entire front in which they may be employed.

- (4) List the identifying numbers of the map sheets required to cover the area included within the field army boundaries, including sheets bordering closely on the boundaries.

- (5) Determine the number of copies of each sheet required at each echelon, using factors presented herein or developed experience factors.

- (6) List the total number of copies of each map sheet required. These are planning figures for *initial issue*. *Replenishment requirements* are determined by multiplying the number of each sheet required for initial issue by the proper percentage factor given in c above. The sum of the initial requirement plus the replenishment requirement for each sheet represents the total number of copies of each sheet that must be procured. These are procured from higher echelon or produced by topographic units within the field army.

3.6. Production of Maps

a. General Production Factors.

- (1) In planning an operation, map requirements are estimated well in advance of the operation and are requisitioned from CONUS. Theater, field army, and corps produce maps to supplement planned requirements. As a

general rule, supplemental maps of a scale of 1:100,000 and larger are reproduced by field army and corps; maps of 1:250,000 and smaller scale, by the theater army logistical command.

- (2) Press size----- 22½ x 30 inches
- (3) Impressions per
press-day ----- 30,000 (bulk work
only)
- (4) Average map
paper consump-
tion per field
army ----- 5,000 reams/
month
167 reams/day
- (5) Maximum map
paper consump-
tion per field
army ----- 500 reams/day
- (6) Photomap paper
consumption
per field army- 1,000 reams/
month
- (7) Number of colors
or press impres-
sions—
Maximum ----- 8
Standard ----- 5 (black, brown,
blue, green, and
red)
Expedient ----- 1, 2, 3

Two- and three-color maps are far superior in readability to one color and should be adopted when time for standard color reproduction is not available.

b. Production Capacity Required.

- (1) Field army—3,000,000 impressions per month.
- (2) Theater army logistical command.
 - (a) Five million impressions per month for each three field armies supported.
 - (b) A new mapping capacity of 100 square miles per day.

3.7. Storage of Maps

a. General Planning Factors.

(1) Paper.

	1	2	3
1	Sheet size (in.)	Line maps—high wet strength ¹ (lb per 1,000 sheets)	Photomap—coated two sides (lb per 1,000 sheets)
2	22½ x 29-----	85.7	98.4
3	22 x 29-----	81.9	94.1
4	24 x 34-----	104.7	120.4
5	26 x 32-----	106.8	122.7
6	28 x 50-----	179.6	206.5
7	35 x 45-----	201.6	233.1
8	Thickness, 1,000 sheets	4 in.	3.5 in.

¹ For U.S. hydrographic charts, use twice the weights shown.

(2) Crated or bundled maps.

	1	2	3
1	Item	Avg wt (lb)	Avg cu ft
2	Bundle, 500 map sheets---	60	2
3	Crate, 1,000 map sheets---	150	5

- (3) *Plastic relief maps.* There are many variations in sizes and weights of plastic relief maps. For specific information on storage of this type of map, consult experience factors or the Army Map Service.

b. Floor Space.

- (1) A base map depot for each group of three field armies requires 45,000 square feet, increasing at the rate of 7,500 square feet per month of operations.
- (2) A base map depot for each air force requires 10,000 square feet, increasing at the rate of 2,000 square feet per month of operations.
- (3) An advance map depot serving a field army requires 10,000 square feet.

3.8. Distribution of Maps

a. General. Although maps are an item of class IV supply, several factors establish them

as a peculiar supply item which must be handled separately through a system set up exclusively for this purpose. The special factors which place map distribution in a class by itself are as follows:

- (1) *Security.* Bulk production, movement, and issue of maps are accurate indexes of the scope of forthcoming operations.
 - (2) *Transitory application.* Changes in culture, as revealed by the constantly expanding sources of information, may quickly render maps obsolete and may require several improved editions or issues in the course of a single operation.
 - (3) *Relation to the operation.* Unlike other supply items, maps have a direct relation to the exact place in which the operation is to occur.
 - (4) *Phasing of supply.* In general, bulk stocks of maps cannot be prepared, and distribution planned, far in advance. However, collection of source material for map production must be constant and worldwide. Production must be phased to insure the application of the last bit of terrain information which can be safely used. Issue can be made only after an exact assignment of missions has been made.
- b. *Responsibility.*
- (1) Map requirements for a command are computed by the engineer under the staff supervision of the G2. Requisitions are prepared and submitted through engineer channels in sufficient time to permit the reproduction and shipment of the maps required.
 - (2) Engineers of divisions and larger units are charged with the distribution of military maps in the field, except those maps with a security classification which may require special distribution. They obtain maps not printed by their echelons from the engineers of the next higher units.

c. *Depots.*

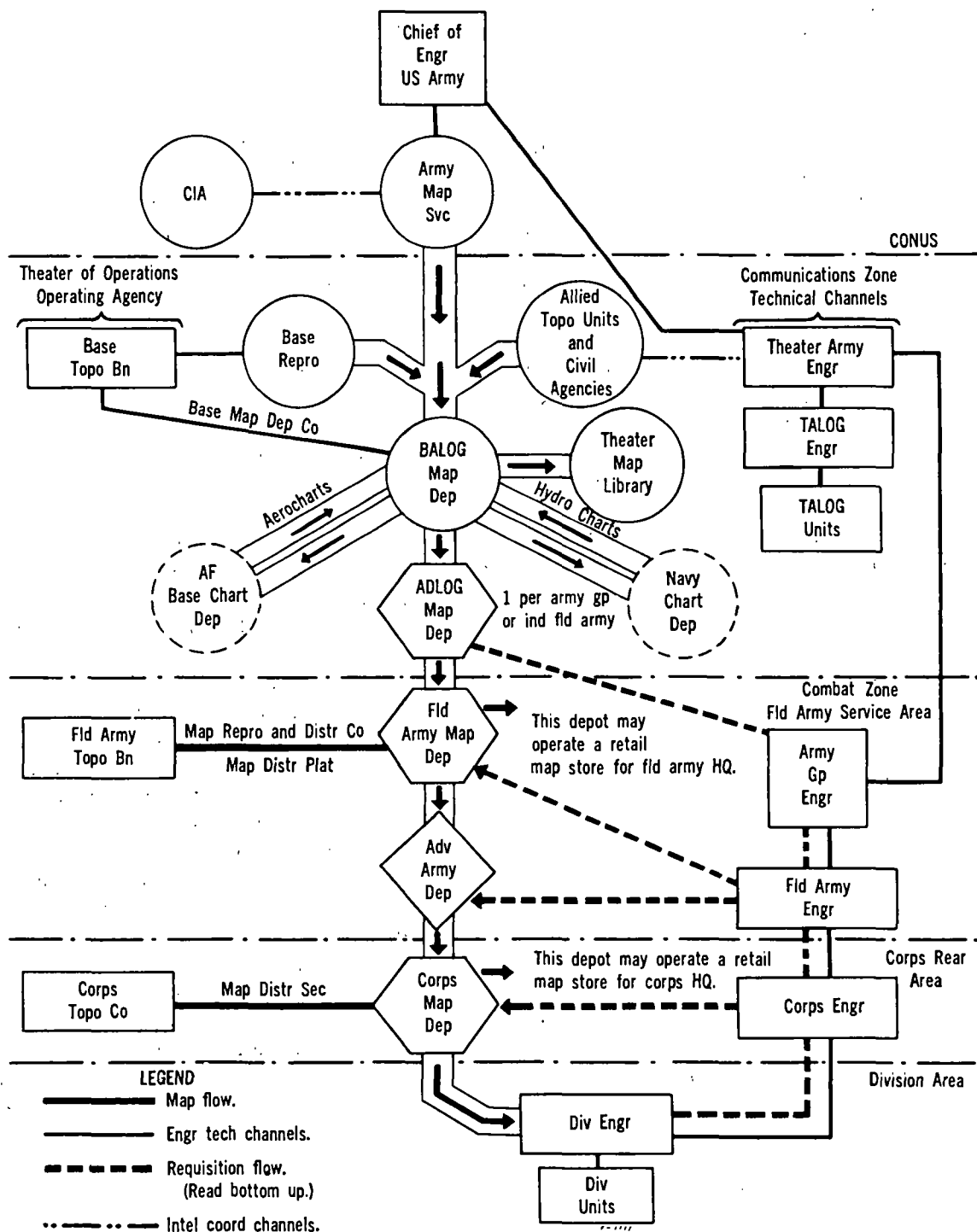
- (1) *Peacetime and CONUS.* Distribution

of maps during peacetime and for CONUS is made by requisitions drawn on the theater or the Army Map Service through channels prescribed by the Chief of Engineers.

- (2) *Wartime theater of operations.*

- (a) BALOG and ADLOG map depots are located in the communications zone, with the ADLOG depot near the forward limit of the communications zone. BALOG map depots receive and store bulk stocks from the Army Map Service and base reproduction plants; break down and distribute bulk stocks to ADLOG depots; distribute to BALOG depot units; and operate a retail map store for BALOG headquarters. ADLOG map depots receive and store bulk stocks from BALOG map depots; break down and distribute bulk stocks to field army map depots; and operate a retail map store for the headquarters of units located in the advance section.
- (b) The field army map depot is located in the field army service area, usually near field army rear headquarters. In a fast-moving operation, it may be necessary to operate two map depots which leapfrog each other as the field army headquarters moves forward. The field army map depot has functions parallel to those of the base map depot. The depot is operated by elements of the field army topographic battalion.
- (c) The corps map depot is located in the corps rear area and has the same functions as the base map depot, but on a smaller scale. It is operated by elements of the corps topographic company.
- (d) Operation of the division map stores is the responsibility of the division engineer. The only functions performed are to receive bulk stocks, distribute maps to divisional and

be estimated at 20 man-hours per 10,000 maps issued, including rolling, coding, packing, and collating unit packages.



3.9. Terrain Models and Plastic Relief Maps

The determination of quantity requirements and the issuance of terrain models and plastic relief maps are matters for staff control. Terrain models and plastic relief maps are seldom stocked outside base plants. The Army Map Service is currently the only base plant for terrain models and does stock plastic relief maps at scales of 1:250,000, 1:1,000,000, and certain other miscellaneous scales. These maps can be requisitioned through proper engineer channels. Quantity requirements depend solely on the estimate of the military situation. The necessary provisions to meet these requirements are determined by staff studies of combat needs; the resultant production and supply of models and plastic relief maps are determined by command decision. The commander, having model-making units under his control, directs that a G2 intelligence study and an engineer technical appraisal be performed to determine what models are to be constructed. When assigned model-making capacities are inadequate, the commander submits appropriate requests to higher headquarters. Upon completion of construction, the model is issued immediately and directly to the headquarters or command for which it was produced.

3.10. Gazetteers

a. Gazetteers (place-name indexes) are issued to higher headquarters only. Initial allowances per medium-scale map series are as follows:

Theater headquarters	25
Theater army headquarters	25
Army group headquarters	10
Field army headquarters	5
Corps headquarters	2
Division headquarters	2

b. Production, storage, and distribution of gazetteers are identical with mapping responsibilities (par. 3.3); in CONUS, the Corps of Engineers is responsible; in a theater of operations, the theater army engineer.

3.11 Trig Lists

a. *General.* A trig list is an organized grouping of data defining geodetic control positions.

The respective elevations, descriptions, and other pertinent information for these ground control points appear within the limits of a map or maps of a certain series to which they are keyed. The horizontal positions are generally arranged by increasing northings on the map sheet so that the user can locate quickly any point on a given map sheet of a series. The vertical stations (bench marks) along the lines of spirit leveling are usually arranged consecutively along the route of the leveling survey.

b. *Trig Lists Normally Provided in Bulk at Each Echelon.* Trig lists normally are provided in bulk at each of the following echelons:

- (1) Army group headquarters and army group troops.
- (2) Field army headquarters and field army troops.
- (3) Corps headquarters and corps troops.
- (4) Airborne division.
- (5) Armored division.
- (6) Infantry division.
- (7) U.S. Army missile command.

c. *Number of Trig Lists at Each Map Scale* (i.e., area coverage required at each scale). The scale of the map sheet to which each trig list is keyed and the number of map sheets covered by a particular trig list will vary from country to country because of density and distribution of the geodetic control. Therefore, it will be necessary to determine the number of map sheets covering the specified area and relate this information to the *Trig List Catalog*, from which the scale and number of map sheets covered per trig list can be determined. A trig list key number appears in the *Trig List Catalog* and on the cover of each trig list. For identification and logistical reference, the trig list key number is used.

- (1) *Field army area coverage.* The number of different trig lists required per field army can be determined on the same basis as for maps.
- (2) *Division and smaller unit area coverage.* The number of trig lists required to cover an average area of operations can be determined on the same basis as for maps.

d. Guides for Estimating Quantities of Trig Lists Required for Initial Issue.

- (1) Trig lists should be distributed only to those units having requirement for geodetic data (i.e., staff engineers, engineer topographic units, artillery units, missile units, etc.).
- (2) In addition to the guides stated in (1) above, the following quantities are needed by units indicated.

(Note. In most foreign countries, trig lists are classified CONFIDENTIAL.):

Unit	No. of trig lists
(a) <i>Army group:</i>	
Army group engineer-----	1
Survey liaison detachment-----	1
Engineer bn (base) (topo)-----	2
(b) <i>Field army:</i>	
Field army engineer-----	1
Engineer bn (army) (topo)-----	2
(c) <i>Corps:</i>	
Corps engineer-----	1
Engineer co (corps) (topo)-----	2
Corps artillery-----	10
Per weapons bn-----	1
(d) <i>Infantry division:</i>	
Division artillery-----	9
HQ and HQ btry-----	(3)
3 FA how bn, 105-mm and 155-mm, towed (ea 1)---	(3)
2 FA how bn, 105-mm and 155-mm, SP (ea 1)-----	(2)
FA bn, 762-mm rkt, SP, 8-in. how, towed-----	(1)
Division engineer-----	1
(e) <i>Armored division:</i>	
Division artillery-----	11

Unit	No. of trig lists
HQ and HQ btry-----	(3)
3 FA how bn, 105-mm, SP (ea 2)-----	(6)
FA bn, 155-mm, 8-in. how, 762-mm rkt, SP-----	(2)
Division engineer-----	1
(f) <i>Airborne division:</i>	
Division artillery-----	8
HQ and HQ btry-----	(2)
5 FA how btry, 105-mm (ea 1)-----	(5)
FA msl btry, 762-mm rkt---	(1)
Division engineer-----	1

- (g) *U.S. Army missile command.* To be determined by the mission.

e. Production of Trig Lists.

- (1) *Responsibilities.* Compilation and printing of trig lists will normally be accomplished by the Army Map Service (CONUS) and all military topographic units (theater of operations) having the geodetic data and survey results necessary to compile field sketches for each station, to prepare bilingual descriptions, and to compute necessary coordinate systems required for the area. Trig lists produced in CONUS are considered adequate reproduction material and can be reproduced in the theater of operations by military topographic units.
- (2) *Format.* Trig lists are bound publications of 1/4- to 1/2-inch thickness, with a trim size of 9 x 11 inches, and are printed on map stock, high wet-strength paper.

Section III. AERIAL PHOTOGRAPHY

3.12. Types.

a. Types of Aerial Photos. An aerial photo is any photograph of a portion of the earth's surface taken from a vehicle in flight. Aerial photos may be taken with black-and-white, color, infrared, or other film. The following are types of aerial photos:

- (1) *Vertical photo.* An aerial photo taken with the optical axis of the camera approximately vertical to the earth's

surface. The scale of vertical photography is approximately uniform throughout the image.

- (2) *Oblique photo.* An aerial photo taken with the camera axis intentionally directed between the horizontal and vertical. The scale of an oblique photo decreases progressively from foreground to background.

- (3) *Composite*. An aerial photo made by assembling the separate photographs taken by each lens of a multiple-lens camera in a simultaneous exposure.
- (4) *Stereopair*. Two aerial photos with sufficient overlap and consequent duplication of imagery to make possible stereoscopic examination of an object or area common to both.
- (5) *Photomosaic*. An assemblage of overlapping aerial photographs whose edges have been matched to form a continuous photographic representation of a portion of the earth's surface.
- (6) *Continuous strip photo*. An aerial photo of a strip of terrain in which the image remains unbroken throughout the entire length of the film.

b. *Types of Aerial Photo Coverage*. The term "aerial photo coverage" denotes the ground area represented on aerial photos, photomaps, and photomosaics. Aerial photo coverage falls into two general classes: intelligence cover and mapping cover. Coverage for mapping is related to the type and accuracy of the map to be produced. Planning data for mapping coverage are contained in TM 5-243 and in special publications.

- (1) *Basic cover*. Basic cover is complete photo coverage of a projected area of operations flown periodically or seasonally to fulfill general operational and intelligence requirements and to provide, with subsequent photography, a basis for comparative photo studies. Basic cover usually extends from

friendly forward dispositions to a depth of 100 miles or more, as required, into enemy-held territory. For greatest effectiveness, basic cover should be at a scale of 1:12,500 or larger.

- (2) *Tactical cover*. Tactical cover is current vertical stereoscopic photography across the field army front extending from friendly forward dispositions to a depth determined by operational and intelligence requirements. The depth to which it is flown is usually determined by the maximum range of friendly artillery or by the location of selected objectives during an offensive operation. For maximum effectiveness, it should be at a scale of 1:10,000 or larger. Tactical cover is flown as requested by field army.
- (3) *Special cover*. Special cover is photography specifically requested for special study of selected targets or critical areas to meet immediate information requirements of combat units. The scale and type of photography will vary, depending on the type of target and the information required.

3.13. Requirements for Aerial Photography

a. An initial issue of basic cover is made to field army units according to their requirements. Supplemental issues are made as required during the progress of the campaign. Typical initial issue of basic cover is shown in the following chart:

1	2	3	4	5	6	7
Unit or agency	No of sets	Depth into enemy territory (mi)	No. 9 x 9-in. photos		Total (approx lb)	
			1:25,000	1:10,000	1:25,000	1:10,000
Fld army G2 (air recon spt bn).	(Based on 100-mi width) 2 sets fld army zone/sector.	300	20,000	124,000	666	4,133
Fld army G2 (PI sec)	(Based on 100-mi width) 1 set fld army zone/sector.	300	10,000	62,000	333	2,066
Corps G2 (PI sec)----	(Based on 35-mi width) 1 set corps zone/sector.	100	1,200	7,175	40	240
Corps arty (PI sec)---	(Based on 35-mi width) 1 set corps zone/sector.	100	1,200 ea corps	7,175 ea corps	40 ea corps	240 ea corps
Div G2 (PI sec)-----	(Based on 10-mi width) 2 sets division zone/sector.	50	400	2,110	17	140
Div arty (PI sec) ¹ ----	(Based on 10-mi width) 1 set division zone/sector.	50	200 ea div arty	1,055 ea div arty	7 ea div arty	70 ea div arty

¹ Attached to division from military intelligence bn, fld army.

b. Detailed planning data for determining the number of aerial photographs required to cover a given area are contained in TM 30-245. For general planning purposes, the minimum number of photographs required for stereoscopic coverage of an area at a desired scale can be determined by dividing the square meters of the area by the net gain per photograph. The minimum number of photographs should be increased by about 20 percent to allow for overedge coverage. The net gain planning factors are as follows:

(1) For 9 x 18-inch photography:

Net gain = $1/40 S^2$ (S = denominator of scale of desired photography)

(2) For 9- x 9-inch photography:

Net gain = $1/80 S^2$

Example:

Given: An area 8,000 meters by 12,000 meters to be photographed at a scale of 1 :5,000.

Find: The number of 9- x 18-inch photographs required.

$$\text{Solution: } \frac{8,000 \times 12,000 \times 40}{5,000^2} = 154 \text{ photographs minimum}$$

154 + 20 percent = 185 total photographs required

c. The following table may be used for initial rough estimates of aerial photo requirements.

Total Photo Requirements for a Field Army

1	2	3	4	5
Area	Cover (scale 1:10,000)			
	Basic ¹		Tactical ² (depth 15 mi)	
	Photos	Wt/lb	Photos	Wt/lb
Field army zone/sector (based on 100-mi width).	Depth 100 mi 21,600	728	1,600	96
Corps zone/sector (based on 35-mi width).	Depth 50 mi 3,640	255	480	34
Division zone/sector (based on 10-mi width).	Depth 25 mi 1,560	108	160	11

¹ Based on issue table (a above).

² Per set of photos.

3.14. Aerial Photo Reproduction and Photointerpretation Units

a. Air Reconnaissance Support Battalion (TOE 51-15C).

(1) Signal air photo reproduction and delivery company (TOE 11-54D). See FM 11-51.

	1	2	3	4
1	Methods of reproduction	Sheet size	Remarks	Capabilities
2	Contact printing aerial photos from negatives.	9- x 9- or 9- x 18-inch prints.	Company reproduces, identifies, and distributes prints of Air Force aerial reconnaissance photos.	Reproduction, identification, packaging, and delivery of 25,000 prints of aerial photos per operational period of 8 hours.

(2) Photointerpretation company (TOE 30-79C).

	1	2
1	Remarks	Capabilities
2	Performs coordinated photointerpretation simultaneously from four widely separated reconnaissance airfields and from the vicinity of the supporting field army headquarters.	Plots and performs immediate interpretation on 5,600 9 x 18-inch, or the equivalent, aerial photos in a 24-hour period. Prepares immediate interpretation reports on these photos and annotates selected negatives before reproduction. Performs mission review, summary, and special interpretation as required.

b. Air Force Photographic Units.

	1	2	3
1	Unit	Photographs furnished	Remarks
2	Reconnaissance wing (theater of operations).	Specialized photography needed by topographic units for photogrammetry and photography for strategic purposes beyond the scope of reconnaissance wings of tactical air commands and tactical air forces.	Wing may include mapping and charting squadrons. Mapping photography ordinarily not suitable for intelligence purposes because of small scale and lack of detail. May contain important information, however, and prints should be made available to military intelligence officers for study.
3	Reconnaissance wings of tactical air commands and tactical air forces.	Photographs needed for intelligence or combat purposes (single photographs, vertical and oblique; stereopairs; or night photographs).	Also visual reconnaissance missions are capable of providing limited vertical and oblique photographs. Photographic missions capable of large quantities of high-altitude vertical and oblique photographs and, under extremely urgent circumstances, limited and low-altitude vertical and oblique photographs.

Section IV. EXPRESSING TIME, DATES, AND NATURAL PHENOMENA

3.15. Time and Dates

a. *Time.* Time is expressed in a group of four digits, ranging from 0000 to 2400. The first two digits are the hours after midnight, and the remaining two digits indicate the minutes past the hour. When the hour can be expressed by a single digit, it is preceded by zero (0); for example, 0625 for 6:25 a.m. Correct official time is available at the nearest signal center.

b. *Dates.*

- (1) The day, month, and year are expressed in that order, except when it is necessary to specify a six-digit time group and then the following order is used: the first two digits indicate the day of the month, the next two digits indicate the hour, and the last two digits indicate minutes past the hour.

Example: 070625 Dec 47 (6:25 a.m. 7 Dec 47).

The day is expressed by numerals; the month is either spelled out or abbreviated. Abbreviations, if used, consist of the first three letters of the word. The year is expressed by four digits or by the last two digits.

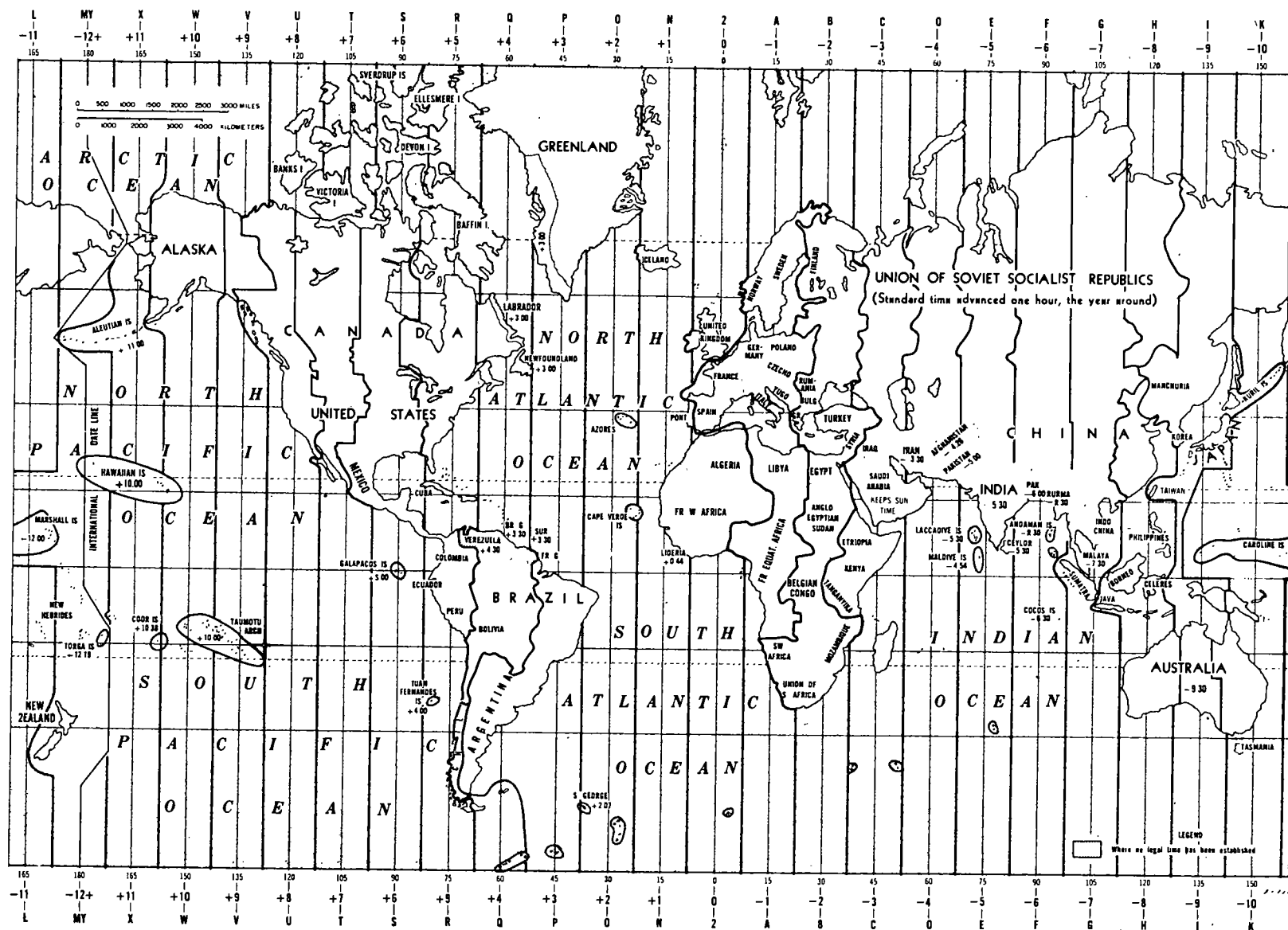
Example: 14 January 1946; 14 Jan 1946; 14 Jan 46.

- (2) When it is desired to keep the date secret, dates may be expressed by a

letter such as D plus or minus a numeral.

c. *Greenwich Civil Time.* Communications between headquarters in different time zones are usually dated, and references to dates and times are usually made in Greenwich civil time. The standard time at Greenwich, England, is accepted as the basis for measuring time throughout the world. Local civil time can be changed to Greenwich civil time by adding or subtracting the appropriate number of hours as indicated in the time zone chart in *e* below. Greenwich civil time can be changed to local civil time by reversing the signs of the time zone chart. Appropriate adjustment must be made for daylight saving time and war time.

d. *Time Suffixes.* Time groups expressing Greenwich civil time are designated by the letter suffix Z immediately following the last digit of the group. For example, 190225Z indicates 2:25 a.m. on the 19th of the current month, Greenwich civil time. Any other suffix used after a four-digit time group (corresponding to the Z of Greenwich civil time) indicates the zone in which the local civil time is expressed. *It does not designate location on the earth's surface.* The proper suffix can be determined from the time zone chart and the time conversion table in *e* and *f* below. For example, Kansas City is located in the sixth time zone west of Greenwich. If that city keeps local civil time, the time group suffix will be S.



f. Time Zone Conversion Table.

TIME ZONE	HOURS OF DAY IN LOCAL TIME																							
	PREVIOUS DAY												SAME DAY											
0 (Z)	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11
-1 (A)	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12
-2 (B)	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13
-3 (C)	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
-4 (D)	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
-5 (E)	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
-6 (F)	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
-7 (G)	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
-8 (H)	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
-9 (I)	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
-10 (J)	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
-11 (K)	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
-12 (L)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
+1 (M)	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10
+2 (N)	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09
+3 (O)	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08
+4 (P)	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06	07
+5 (Q)	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06
+6 (R)	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05
+7 (S)	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04
+8 (T)	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03
+9 (U)	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02
+10 (V)	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01
+11 (W)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00
+12 (X)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23

3.16. Natural Phenomena.

a. *General.* Staff officers avoid the use of such indefinite terms as *first light*, *last light*, *daybreak*, *daylight*, *dusk*, and *dawn*. Terms of a definite nature, such as *beginning* or *ending of evening* or *morning nautical* or *civil twilight*, are permissible. However, expressions of these times to lower units must be in clock time.

b. *Published Data.* For purposes of military planning and to facilitate staff work in expressing natural phenomena in time, theater commanders prepare and publish for the theater as a whole or for major geographic portions thereof daily time, sunrise, sunset, twilight, moon, and tide tables and specify the number of hours the local time differs from Greenwich civil time. A sample of the type of chart which should be prepared and issued for each major operation or operational area is shown in e below. They are available through Army channels. Data on time of sunrise, sunset, morning and evening twilight, and moon phases can also be found in TM 5-236 series (current year).

(1) *Datum.* The astronomical data are

for sea level and will not vary more than 5 minutes for each degree of the difference in longitude from the standard meridian.

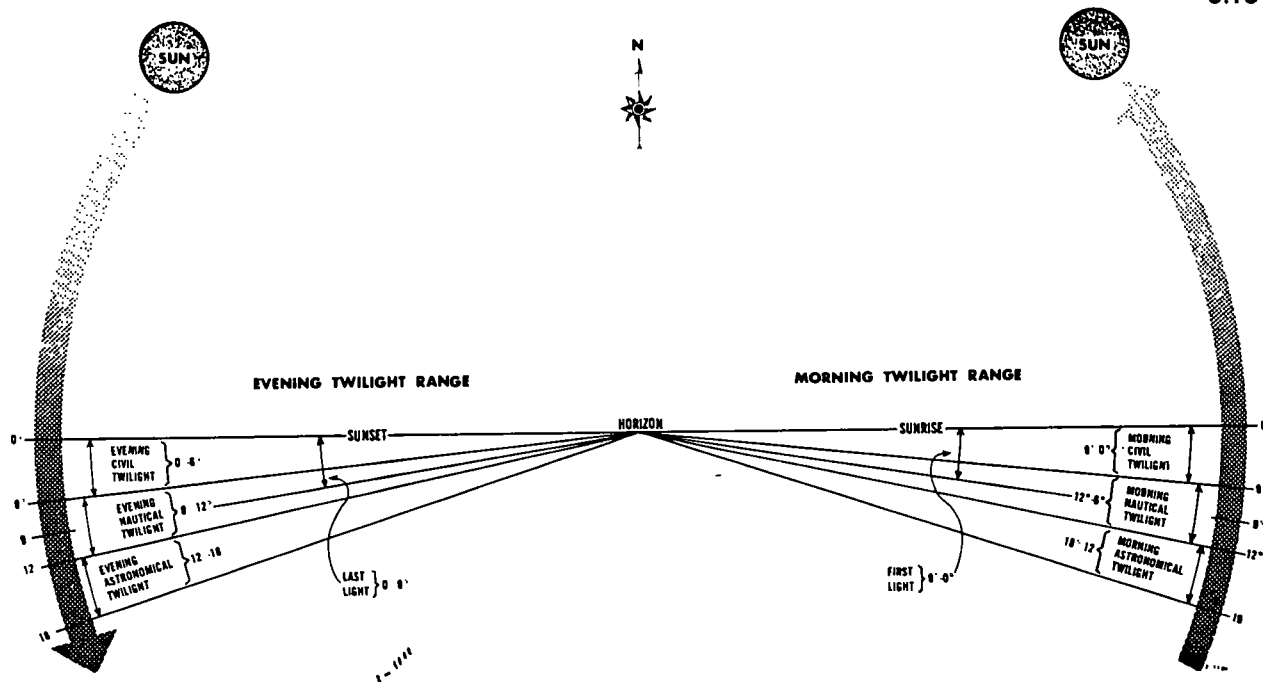
- (2) *Time used.* The times on the diagram are for the time meridian indicated in the heading. When another time meridian is to be used in the field, it will be found convenient to change the figures representing hours on the left of the large diagram to conform to the new time. If the time meridian to be used is east of the one shown on the diagram, increase the figure by 1 hour for each 15°; if west, decrease the figures.
- (3) *Dates.* In the upper diagram, each day from midnight to midnight is represented by a space between two lines. In the lower diagram, the days are represented by vertical lines covering the period from noon of one day to noon of the next. The dates at the bottom of the diagram differ from

those at the top because the date changes in passing through midnight.

- (4) *Tides*. The times of the high and low tides are shown by curves in the lower diagram. By noting the sequence of the tides during a day, the height of any particular tide can be found from the upper diagram.
- (5) *Moonlight*. For astronomical twilight and solar darkness, periods of moonlight and dim moonlight are shown on the lower diagram. During the period of *moonlight*, the intensity of light will vary between the brightness of the full moon at zenith and about one-third of this value. During the period of *dim moonlight*, the intensity varies from about one-third to one-tenth of the brightness of full moon at zenith.
- (6) *Moon's phases*. The phases of the moon are shown below the day on which they occur.

c. *Twilights*.

- (1) Twilights are the periods of solar illumination prior to sunrise and after sunset. Both morning and evening twilights are divided into three periods: astronomical, nautical, and civil. The interval of time between the instant the upper edge of the sun's disk appears on the horizon and the instant the center of the sun is 6° below the horizon is civil twilight, 6°-12° nautical twilight, and 12°-18° astronomical twilight.
- (2) Astronomical twilight affords such meager light, if any, that for military purposes it may be considered as a period of darkness.
- (3) Nautical twilight provides enough illumination to carry on most types of ground movement without difficulty and approaches conditions expected under full light of day. Vision is limited to 400 yards or less. For military purposes, during the nautical twilight periods weapons can be employed within the range of vision stated and daylight calculations relative to movement will apply, including restrictions on such movement. Bomb loading and repair work cannot be carried on without the use of artificial light.
- (4) Civil twilight affords sufficient light to carry on normal day activities. This period is the earliest or latest that provides sufficient natural illumination of targets to allow efficient observed artillery fire or day bombing.
- (5) Except for high latitudes, values for the approximate durations of astronomical, nautical, and civil twilights may be considered equal.
- (6) *First light* and *last light*, terms used by the armed forces of the United Kingdom, include a slightly greater period of twilight than defined by civil twilight.



NOTE: Degrees refer to center of sun below horizon.

Twilight factors.

d. *Effect of Weather on Light.* Weather has been disregarded in the above considerations. Smudge, fog, clouds, refraction, reflection, and precipitation affect the degree of illumination.

These factors can be included in the calculations by means of experience tables compiled in the area over a period of time and from meteorological forecasts for the area only.

e. Diagram of Tides, Sunlight, and Moonlight.

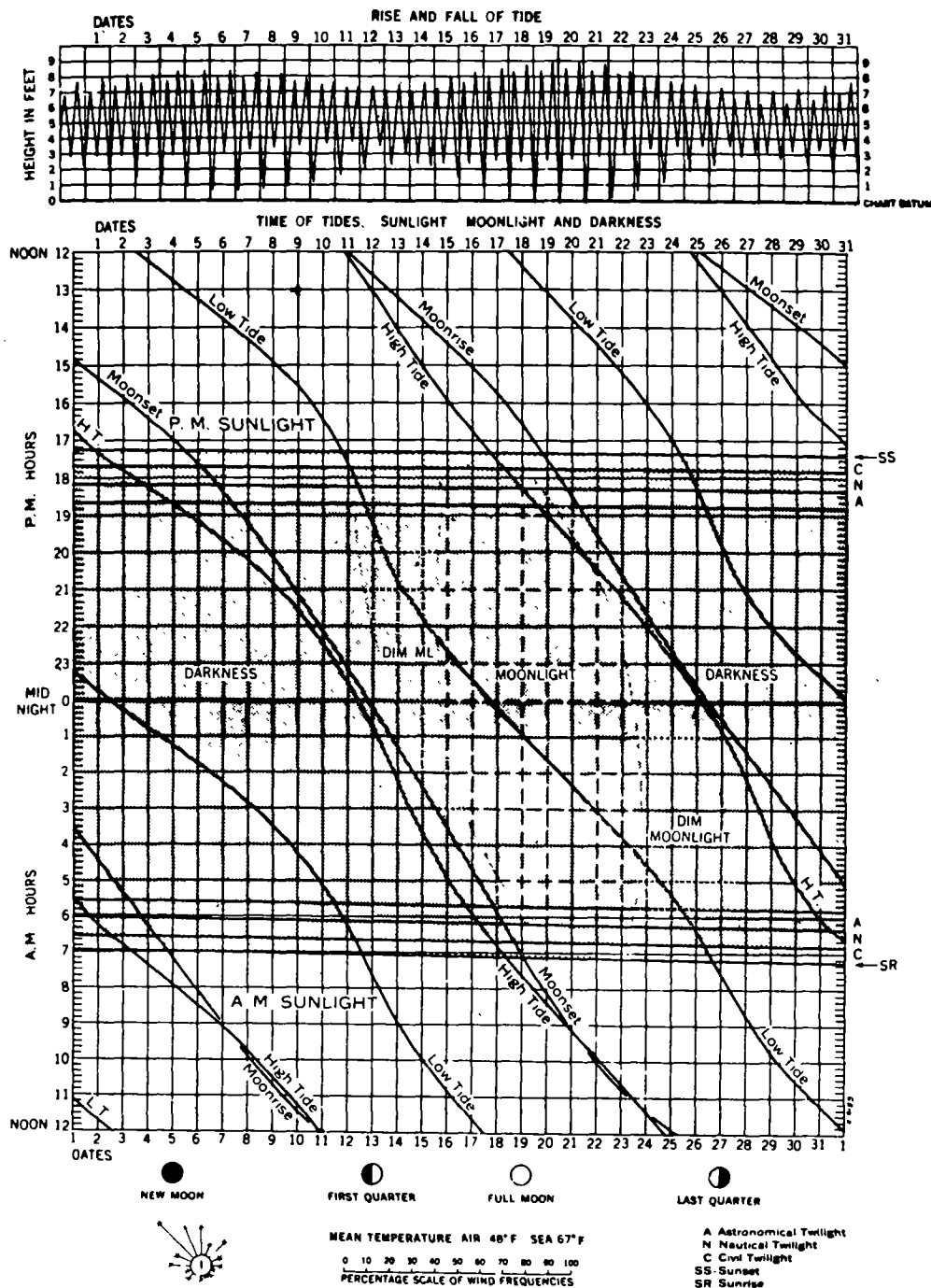
KAGOSHIMA—WAN, KYUSHU *

DECEMBER 1945

Lat 31° 30' N., Long 130° 40' E.

Time Meridian: 135° E.

Sunlight and Moonlight Data Computed for Lat 31° 30' N., Long 130° 40' E.



*This diagram, with the changes indicated, is also applicable to the following places:
TOMARI URA.—Add 10 minutes to times of high and low tides, subtract ½ foot from heights of high tides.
ODOMARI WAN.—Subtract 25 minutes from times of high and low tides, subtract 1 foot from heights of high tides.

CHAPTER 4

OPERATIONS

Section I. TROOP PLANNING

4.1. Introduction

a. General. The number and type of units to be employed in a given operation are determined by the mission; the character, disposition, and capabilities of the enemy; the terrain and climate; the availability of troops and/or units; the availability of transportation; and the availability of supplies and equipment.

b. Basic Steps in Troop Requirements Planning.

- (1) The following general steps are essential to the accomplishment of sound troop requirements planning:
 - (a) Determination of the functions or tasks to be performed.
 - (b) Determination of quantitative workload.
 - (c) Selection of type of operating unit, with capability required.
 - (d) Calculation of number of operating units required.
 - (e) Provision for command and control.
- (2) The accomplishment of the steps listed in (1) above requires a detailed study of the overall mission by each member of the staff in light of his responsibilities and the factors which affect the accomplishment of the mission.

c. Planning Procedures. Troop requirements planning passes through three phases—*estimation*, *calculation*, and *modification*. The first phase, particularly in the case of the establishment of a new theater, must be accomplished with few, if any, tangible figures. Each successive phase is developed with more concrete and accurate data than the preceding one, until a balanced, sound troop list is evolved.

- (1) *Phase I planning—estimation.* The initial step in the development of troop requirements must be accomplished

with little specific data—often no more than a brief statement of the overall strength of the force to be employed or the number of divisions around which it is to be built. Each planner must employ broad experience factors, such as division and wing slice, troop density, equipment density, replacement and consumption factors, and similar information. For example, when the total troop strength is unknown, it can be estimated by using appropriate division and wing slices. From this figure, and from basic vehicle density factors, the number of vehicles in the force can be estimated. Other data are derived in a similar fashion. The margin of error will depend to a great degree on the accuracy of factors employed. Factors representing best available experience should be used, and the planner is cautioned against changing factor values unless he has the experience and background to make such changes valid.

- (2) *Phase II planning—calculation.*

- (a) Phase II planning begins when phase I estimates are received from all arms and services in the form of initial tentative troop lists. Troop strengths and equipment lists for the force can be derived from these initial lists, which should be more accurate than the estimates used to initiate planning in phase I. The margin of error between the initial tentative lists and those finally accepted will depend not only on the adequacy of the planning factors and guidance available to the troop requirement planners, but also on

the experience, aptitude, and judgment of the individual planner. Technical service troop planning officers should carefully scrutinize the lists of the arms and services to determine whether they contain errors. Branch strengths in relation to the total force strength should be compared with currently accepted percentages and should be challenged if they deviate significantly.

- (b) When the consolidated initial troop list is available, each planner should review the list and decide, based on the new information from the consolidated list, whether his next revision will increase or decrease and to what extent. The predictions of each planner should be appraised for accuracy, and a recalculation of the first revised troop list should be made as a result of these predictions. This information should then be furnished all planners so that each will be aware of direction and limits of changes which are to be applied.
 - (c) When this information is available, phase II planning continues with the preparation of revised estimates by each branch representative. The division slice and other factors suitable only for initial estimation are discarded in favor of actual (or adjusted) figures extracted from the initial lists. Several revisions may be necessary before all arms and services lists are brought into balance with each other. Intelligent adjustment and careful prediction at each successive planning stage will reduce the number of revisions necessary to arrive at a calculated balanced troop list to complete phase II.
- (3) *Phase III planning—modification.*
- (a) The consolidated troop list produced in phase II will provide a balanced

force, each element of which is capable of performing its mission without augmentation. Modifications, adaptations, or alterations dictated by policy, by command direction, or by conditions peculiar to the theater under consideration are applied in phase III, if not already taken into consideration in phase I or phase II.

- (b) Substitution of indigenous labor for military personnel should be made at this stage. At the same time, lists of class IV equipment to be issued for the use of the indigenous labor forces should be prepared.
- (c) The substitution of indigenous labor for military personnel will immediately throw the troop list out of balance, and it may require several successive revisions such as those made in phase II to restore it to balance. Various services will be affected differently. The impact on ordnance will be relatively small since the equipment density will not change significantly; but the impact on the medical troop list is great since medical service is provided primarily on the basis of military strength. Other services will be affected to greater or less extent depending on the change in military strength and equipment required.
- (d) Since substitution of indigenous labor in phase III will cause an imbalance and make additional revisions necessary, consideration should be given to effecting the substitution earlier in the planning. This would simplify matters for services, such as medical, interested primarily in military strengths; but it will complicate matters for those services which must prepare lists of class IV equipment for the labor force. If the labor force is planned concurrently with the military forces, the class IV equipment lists must be included in each step and

revised accordingly. This will complicate and delay the steps in planning for all services and may introduce greater degrees of error in each step. The decision as to which procedure to follow will be made by the chief of the planning group, but the various technical service representatives should present the advantages and disadvantages of each method and make an appropriate recommendation in each case. It is desirable to establish 100 percent military troop lists against which augmentations and comparisons may be made.

- (e) Arbitrary personnel ceilings are frequently imposed on the technical and administrative services. These should not be applied until phase III since the reduction in strength may not be proportional for all services or for all units within a service. If the full military strength required to accomplish a mission is known, the effects of a reduced strength can be adequately appraised and reported to the head of the planning staff and force commander.
- (f) Final distribution of troops by zone or area and determination and location of depots and other major installations are accomplished in phase III. If these are done tentatively for each troop list prepared in phases I and II, the final determination is simplified, since each planner becomes increasingly aware of the deployment of the troops of other arms and services throughout the theater and progressively adjusts his own distribution to meet the probable load.

4.2. Troop Requirements, Type Field Army

a. The tables shown in this paragraph indicate the numbers and types of units that might be found in a type field army under conditions of either general or limited warfare in nuclear or nonnuclear situations and for situations short of war. Such a field army is presumed to have three corps of three infantry divisions and one armored division each. TOE designations shown are current approved types or have been officially designated by the Department of the Army as proposed or tentative types. It is emphasized that the tables in *e* below purport only to illustrate the many and various types of nondivisional units which may be employed in the field and the principles of organization of these units. The tables do *not* attempt to depict an organization for the conduct of operations in a specific situation or to connote in any way that they compose a type force in the field. They have been designed to illustrate the types of units that *may* be found in a field army. Actually, forces within the field army will be tailored in composition or size to perform assigned missions and to meet the requirements of locale and forms of conflict. For example, in small theaters of operations where austere lines of communications must be established hastily, many of the units shown in these tables will be deleted. Other organizations, not now listed, may be added, depending on the missions and the environment.

b. The diagrams show the schematic layout of the units and the general areas of their operation. They are not intended to show the attachment or assignment of units to corps and divisions except in a very general way, and they are not intended to show the exact location of units.

c. For troop requirement planning factors for a large theater of operations, see FM 101-10, part III, paragraph 4.2.

FM 101-10
PART I
4.2

d. Divisions.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Armd div.....	17D	14,617	1	-----	3
3	Inf div.....	7D	13,748	3	-----	9
4	Abn div.....	57D	11,486	As required	As required	As required

e. Nondivisional Units.

(1) Armored units—numbers and types.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	Armd cav regt.....	17-51D	2,799	1	1	4
3	HQ & HQ co, armor gp.....	17-32D	64	1	-----	3
4	Armor bn, 90-mm.....	17-25D	716	3	-----	9

(2) Army aviation units.

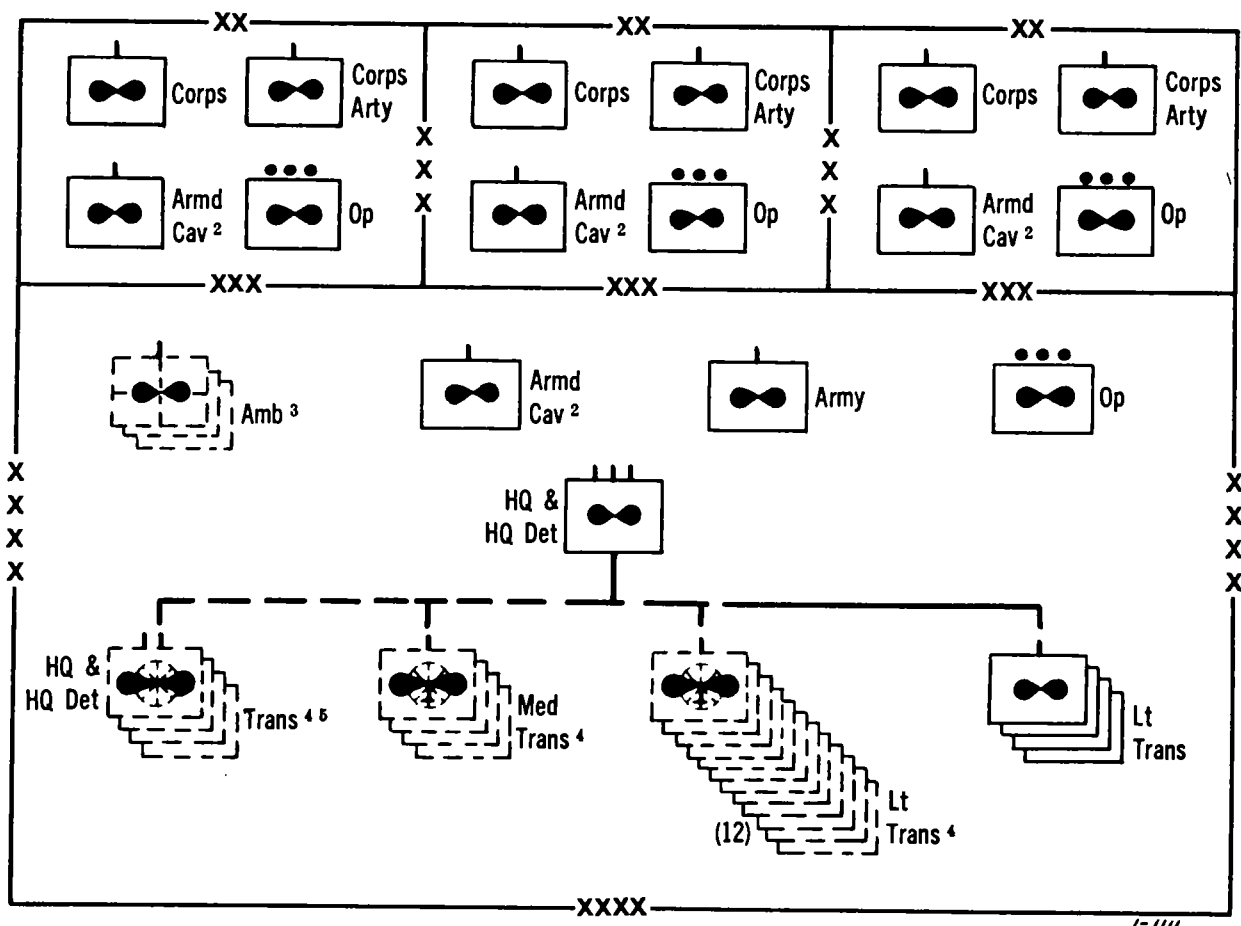
(a) Numbers and types—Army aviation units.¹

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ det, avn gp.....	1-102P	77	-----	1	1
3	Army avn co.....	1-137D	158	-----	1	1
4	Corps avn co.....	1-127D	181	1	-----	3
5	Corps arty avn co.....	1-117D	171	1	-----	3
6	Avn fxd-wing lt transport co.....	1-107T	140	-----	4	4
7	Army avn op det.....	1-207D	44	1	1	4
8	Armd cav regt avn co ²	1-67D	168	1	1	4

¹ See (b) and (13) below for transportation units performing aviation functions and missions.

² Organic to armored cavalry regiment, TOE 17-51D.

(b) Schematic diagram—Army aviation units.¹



¹ See (13) below for transportation Army aircraft maintenance and supply units.

² Organic to armored cavalry regiment, TOE 17-51D.

³ 8-series TOE.

⁴ 55-series TOE.

⁵ Battalion has the capability of controlling from two to seven companies and is tailored as required by the mission.

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4.2

(3) Artillery units.*

(a) Air defense artillery units—numbers and types.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ btry, ADA bde.....	44-101C	145	-----	1	1
3	HQ & HQ btry, ADA gp.....	44-12C	¹ 110	2	3	9
4	ADA AW bn, SP.....	44-85D	673	4	7	19
5	ADA msl bn, NIKE-HERCULES.....	44-535T	695	-----	6	6
6	ADA msl bn, HAWK (mbt).....	44-235T	502	4	3	15
7	ADA op det, MSL MONITOR.....	44-57T	49	1	3	6

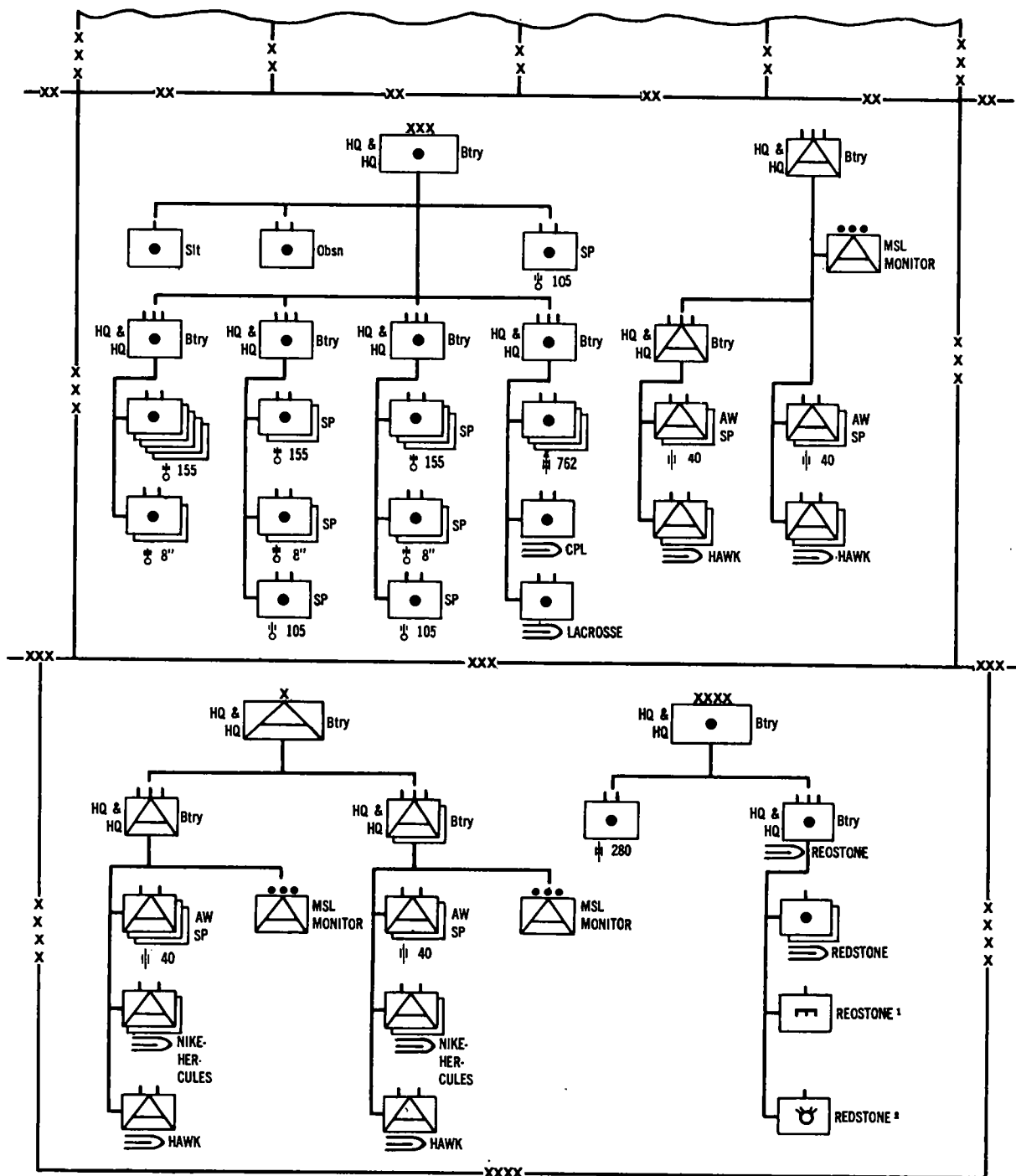
¹ Does not include AAOC section.

(b) Field artillery units—numbers and types.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ btry, army arty.....	6-601 (Tent)	150	-----	1	1
3	HQ & HQ btry, corps arty or abn corps arty.....	6-501D	159	1	-----	3
4	HQ & HQ btry, FA gp.....	6-401D	111	4	-----	12
5	FA how bn, 105-mm, SP.....	6-315D	509	3	-----	9
6	FA how bn, 155-mm, towed.....	6-135C	618	5	-----	15
7	FA how bn, 155-mm, SP.....	6-325C	640	5	-----	15
8	FA how bn, 8-in, towed.....	6-415D	578	2	-----	6
9	FA how bn, 8-in, SP.....	6-415D	528	4	-----	12
10	FA msl bn, CORPORAL.....	6-545E	261	1	-----	3
11	FA msl bn, HONEST JOHN rkt, SP..	6-525D	230	3	-----	9
12	FA msl bn, LACROSSE, SP.....	6-585T	248	1	-----	3
13	FA gun bn, 280-mm.....	6-535C	469	-----	1	1
14	FA obsn bn.....	6-575C	779	1	-----	3
15	FA slt btry.....	6-558D	166	1	-----	3
16	FA msl gp, REDSTONE.....	6-630T	614	-----	1	1

* For data pertaining to artillery units with nuclear capabilities, see FM 101-10, part III, paragraphs 4.3 and 4.4

(c) Schematic diagram—artillery units.



¹ 5-series TOE; organic to field artillery missile group, REDSTONE, TOE 6-630T.

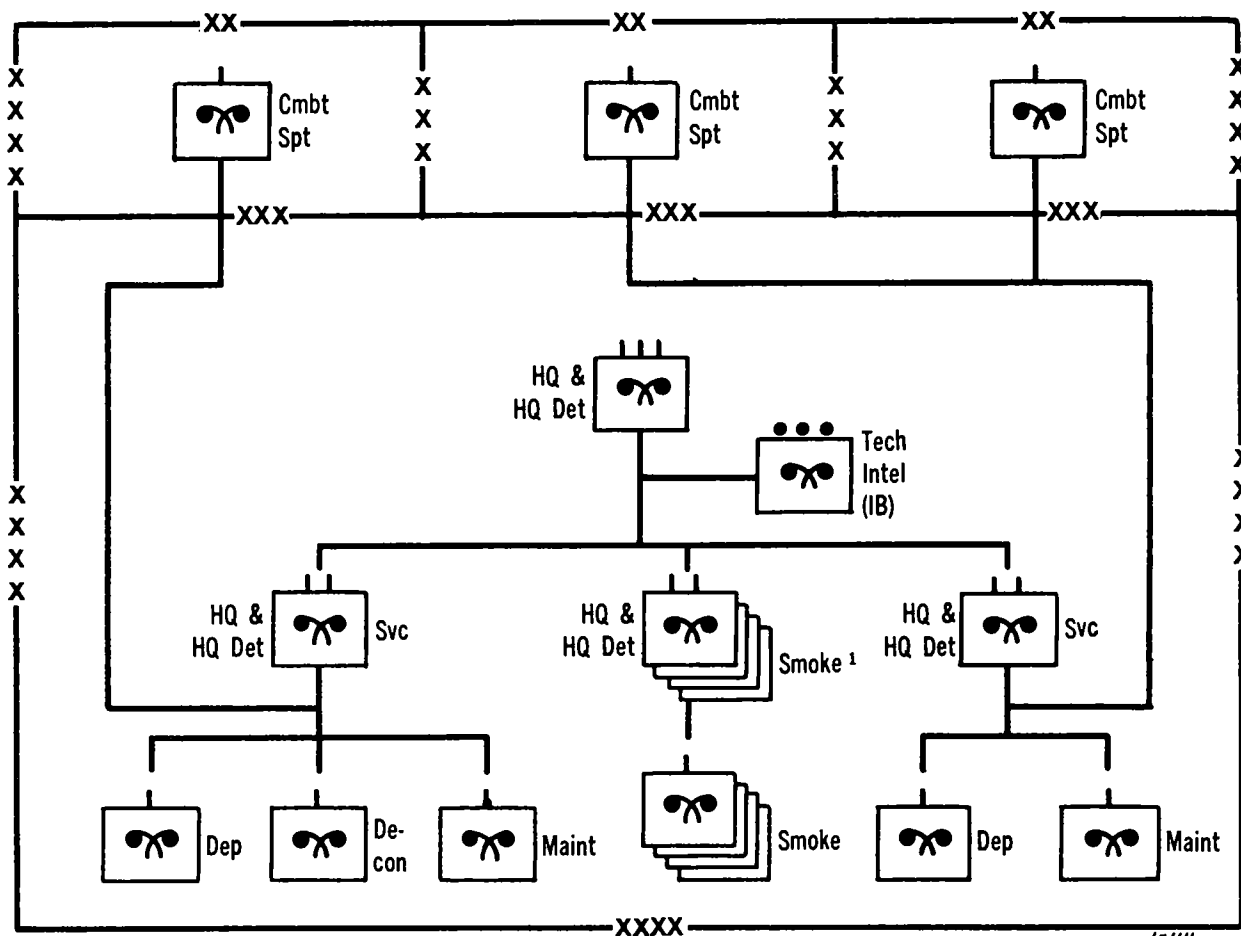
² 9-series TOE; organic to field artillery missile group, REDSTONE, TOE 6-630T.

(4) Chemical units.

(a) Numbers and types—chemical units.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ det, cml gp.....	3-32D	53	-----	1	1
3	HQ & HQ det, cml smoke genr bn.....	3-266D	22	1	1	4
4	Cml smoke genr co.....	3-267D	142	4	4	16
5	HQ & HQ det, cml bn, svc.....	3-36D	32	-----	2	2
6	Cml maint co.....	3-47D	99	-----	2	2
7	Cml dep co.....	3-67D	144	-----	2	2
8	Cml co, cmbt spt.....	3-7D	246	1	-----	3
9	Cml tech intel det (IB).....	3-500D	10	-----	1	1
10	Cml decon co.....	3-217D	115	-----	1	1

(b) Schematic diagram—chemical units.



¹ One battalion normally operates in support of each corps.

(5) *Engineer units.*

(a) *Numbers and types—engineer units.*

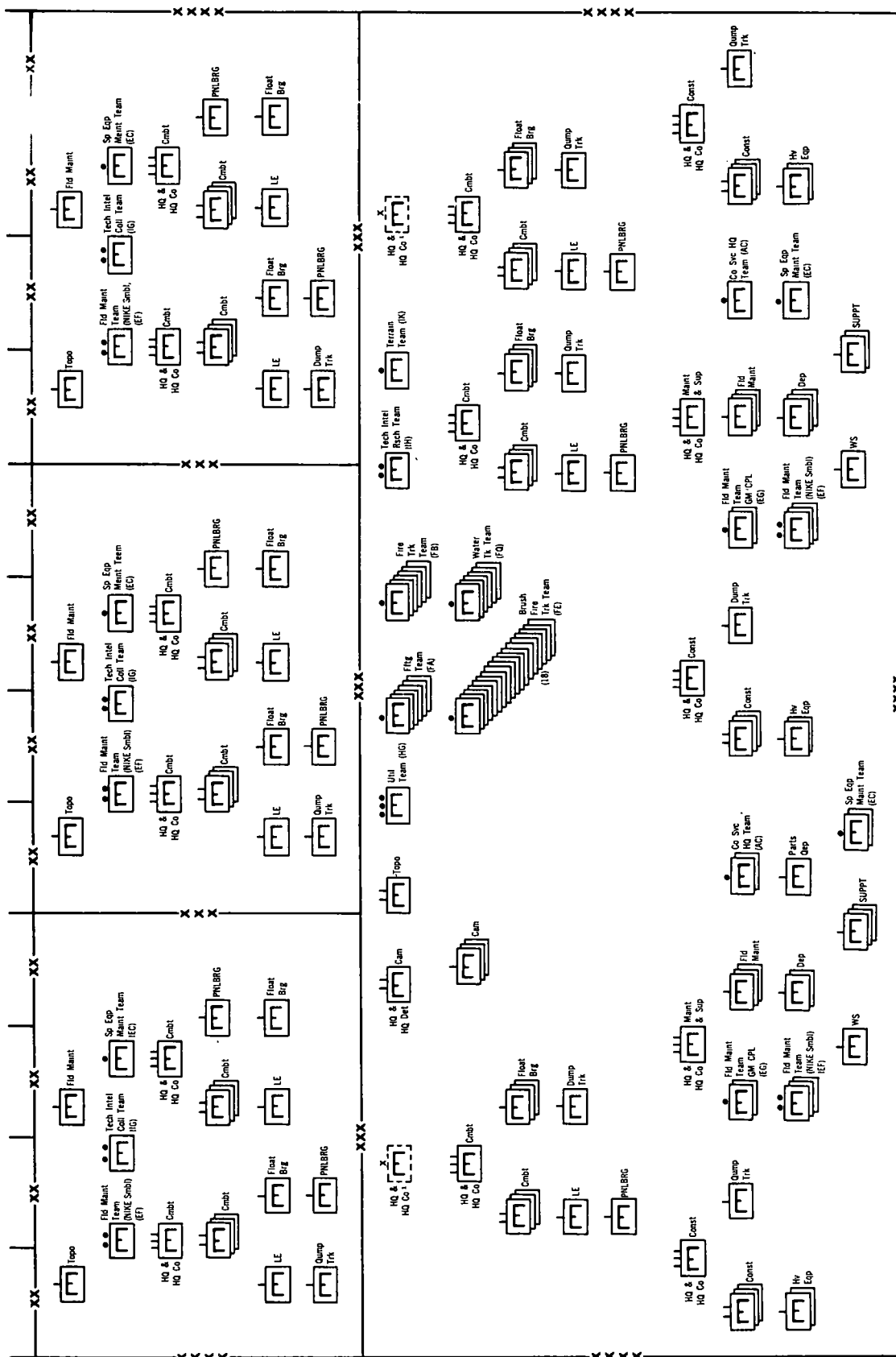
	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ co, engr cmbt gp ¹	5-192C	81	2	3	9
3	Engr cmbt bn, army.....	5-35D	619	6	9	27
4	HQ & HQ co, engr bdc ²	5-301R	142	-----	2	2
5	HQ & HQ co, engr const gp.....	5-312R	79	-----	3	3
6	HQ & HQ co, engr maint and sup gp.....	5-262R	131	-----	2	2
7	HQ & HQ det, engr cam bn.....	5-96D	63	-----	1	1
8	Engr const bn.....	5-315R	714	-----	9	9
9	Engr topo bn, army.....	5-55D	349	-----	1	1
10	Engr cam co.....	5-97D	70	-----	3	3
11	Engr dep co.....	5-267D	201	-----	5	5
12	Engr dump trk co.....	5-124D	108	1	6	9
13	Engr fld maint co.....	5-157C	198	1	6	9
14	Engr float brg co.....	5-78E	225	2	9	15
15	Engr hv eqp co.....	5-328R	168	-----	6	6
16	Engr LE co ³	5-54D	186	2	3	9
17	Engr PNLBRG co.....	5-137D	128	2	3	9
18	Engr parts dep co.....	5-279D	178	-----	1	1
19	Engr co svc HQ team (AC).....	5-500C	8	-----	3	3
20	Engr SUPPT co.....	5-48D	102	-----	5	5
21	Engr topo co, corps.....	5-167C	114	1	-----	3
22	Engr WS co.....	5-67D	110	-----	2	2
23	Engr sp eqp maint team (EC).....	5-500C	8	1	3	6
24	Engr fld maint team (NIKE-smb1) (EF).....	5-500C	19	1	6	9
25	Engr fld maint team GM/CPL (EG).....	5-500C	8	-----	4	4
26	Engr ffig team (FA).....	5-500C	4	-----	6	6
27	Engr fire trk team (FB).....	5-500C	6	-----	6	6
28	Engr water tk team (FD).....	5-500C	2	-----	6	6
29	Engr brush fire trk team (FE).....	5-500C	2	-----	18	18
30	Engr util team (HG).....	5-500C	83	-----	1	1
31	Engr tech intel coll team (IG).....	5-500C	9	1	-----	3
32	Engr tech intel rsch team (IH).....	5-500C	13	-----	1	1
33	Engr terrain team (IK).....	5-500C	11	-----	1	1

¹ May be organized as headquarters and headquarters company, airborne engineer combat group, with aggregate strength of 100.

² May be assigned to corps, field army, or theater army logistical command.

³ May be organized as engineer light equipment company, airborne, with aggregate strength of 177.

(b) Schematic diagram—engineer units.



I May be assigned to corps, field army, or theater army logistical command

(6) *Infantry units—numbers and types.*

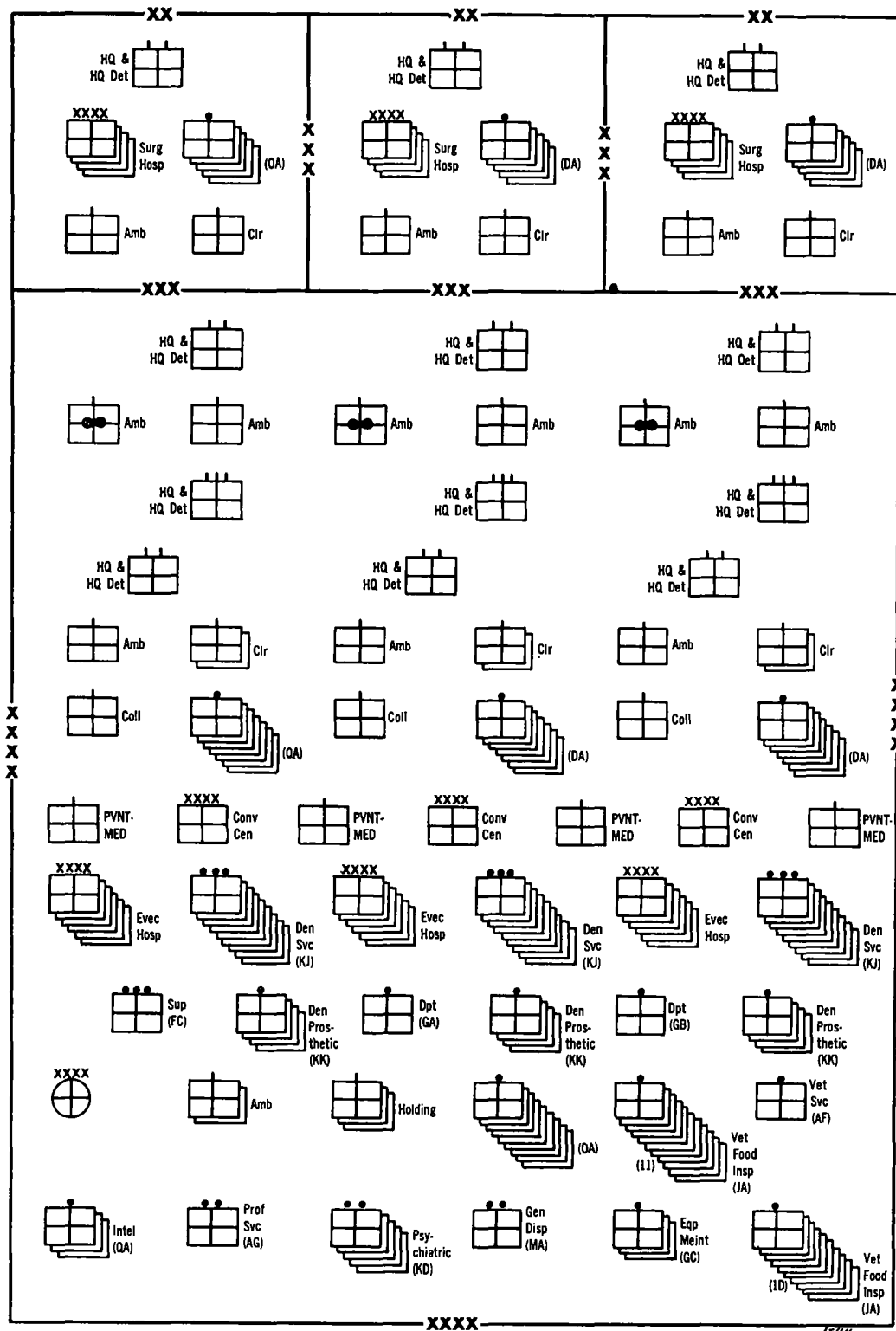
	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ co, inf bde, sep.....	7-52D	273	-----	1	1
3	Inf BG, sep.....	7-11D	1,356	1	3	6

(7) *Medical units.*

(a) *Numbers and types—medical units.*

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ det, med gp.....	8-22C	32	-----	3	3
3	HQ & HQ det, med bn, sep.....	8-26C	29	3	-----	9
4	Med coll co.....	8-129D	191	-----	3	3
5	Med clr co, sep.....	8-28R	125	2	3	9
6	Med holding co.....	8-57D	93	-----	3	3
7	PVNTMED co.....	8-117R	63	0.33	3	4
8	Med amb co.....	8-127D	97	1.67	6	11
9	Med air amb co.....	8-137D	167	-----	3	3
10	Mbl army surg hosp, 60-bed.....	8-571R	119	4	-----	12
11	Evac hosp, smbl.....	8-581R	305	4	6	18
12	Conv cen, army.....	8-590D	284	-----	3	3
13	Army med dep.....	8-667R	201	-----	1	1
14	HQ, professional svc unit (AG).....	8-500C	14	-----	1	1
15	HQ, vet svc (AF).....	8-500C	4	-----	1	1
16	Med sup det (FC).....	8-500C	32	-----	1	1
17	Opt det (GA).....	8-500C	7	-----	1	1
18	Opt det (GB).....	8-500C	2	-----	1	1
19	Med cqp maint det (GC).....	8-500C	5	-----	3	3
20	Vet food insp det (JA).....	8-500C	5	-----	21	21
21	Surg det (KA).....	8-500C	7	2	9	15
22	Ortho det (KB).....	8-500C	7	-----	6	6
23	Shock det (KC).....	8-500C	4	-----	1	1
24	Maxillo-facial det (KD).....	8-500C	7	-----	2	2
25	Neurosurgical det (KE).....	8-500C	7	1	2	5
26	Thoracic det (KF).....	8-500C	7	0.33	2	3
27	Dcn svc det (KJ).....	8-500C	39	5	12	27
28	Dcn prosthetic det (KK).....	8-500C	4	2	6	12
29	Psychiatric det (KO).....	8-500C	18	1	2	5
30	Gen disp (MA).....	8-500C	21	-----	1	1
31	Med det (OA).....	8-500C	9	7	24	45
32	Med intel det (QA).....	8-500C	3	-----	3	3

(b) Schematic diagram—medical units.



(8) *Military intelligence units.**

(a) *Numbers and types—military intelligence units.*

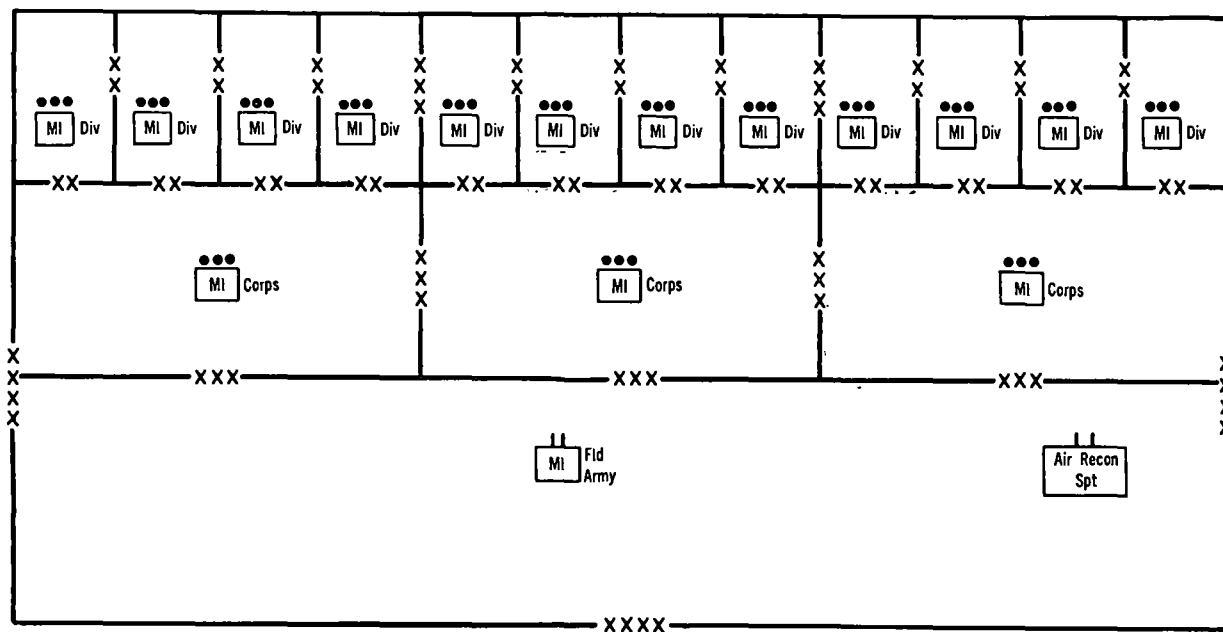
1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
MI bn, fld army (—) ¹	30-15D	596	-----	1	1
MI det, corps or abn corps.....	30-18D	69	1	-----	3
MI det, div.....	30-17D	61	4	-----	12
MI teams ²	30-600D	(³)	As required	As required	As required
Air recon spt bn.....	51-15C	328	-----	1	1

¹ Corps and division detachments are assigned elements of the military intelligence battalion, field army. The number of detachments assigned to a battalion depends upon the number of corps and divisions assigned to the particular field army. Therefore, these detachments are shown separately.

² The field army (or corps) functioning as the senior Army headquarters in the theater may require the assignment of teams from TOE 30-600D. Field armies and corps functioning as part of a larger Army force may receive augmentation teams, as required, of the following types: interrogation, interpreter, translator, order of battle, technical intelligence, strategic intelligence, research and analysis, censorship, and photointerpretation.

³ Strengths will vary according to combination of teams employed.

(b) *Schematic diagram—military intelligence units.*



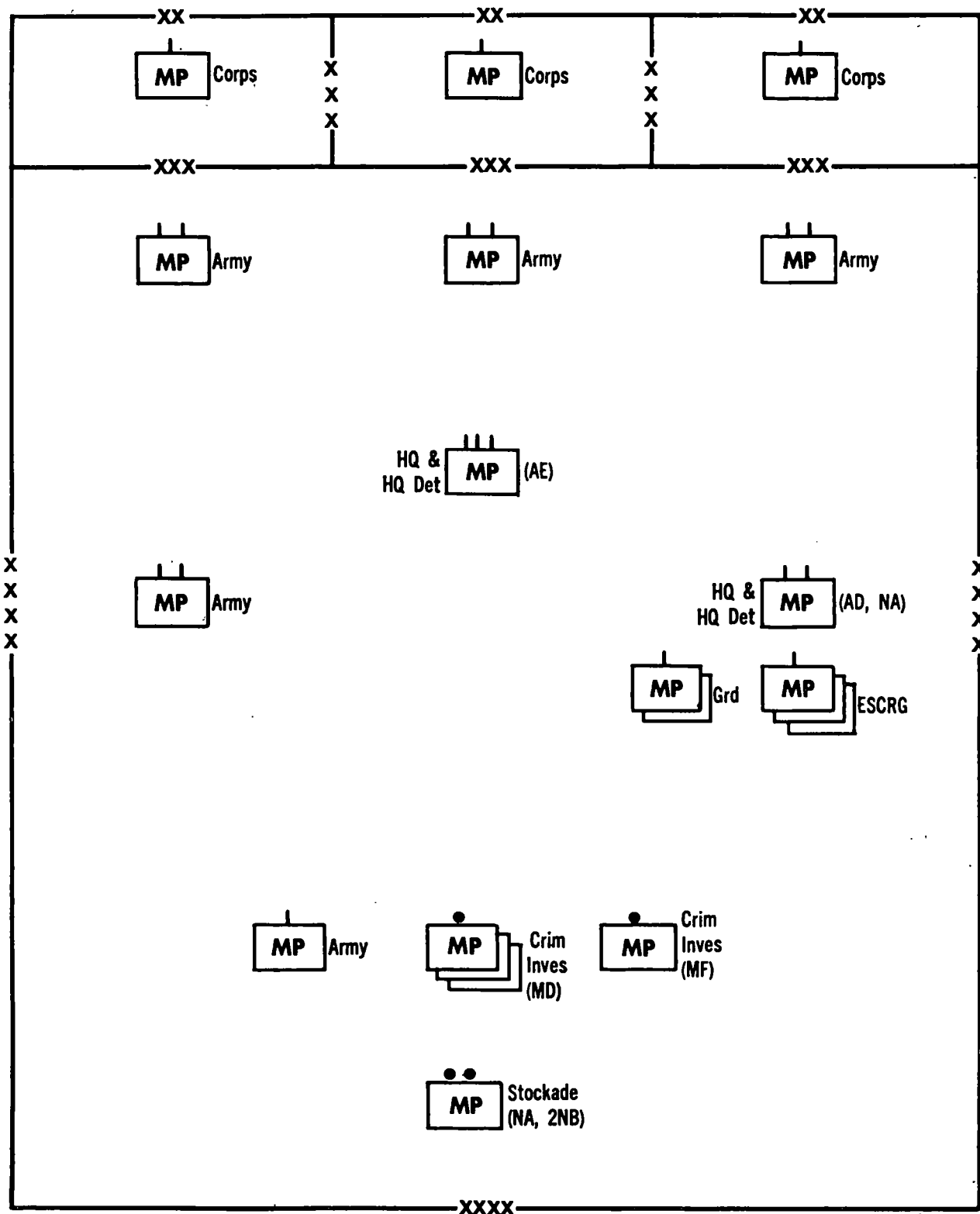
* For data pertaining to intelligence support activities, see FM 101-10, part III, paragraph 4 15

(9) *Military police units.*

(a) *Numbers and types—military police units.*

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
2 HQ & HQ det, MP gp (AE)-----	19-500R	20	-----	1	1
3 MP bn, army-----	19-35D	654	-----	4	4
4 HQ & HQ det, MP bn (AD, NA)-----	19-500R	29	-----	1	1
5 MP co, corps, abn corps, or army (aug)-----	19-37D	198	1	1	4
6 MP ESCRG co-----	19-47D	141	-----	3	3
7 MP grd co-----	19-247C	124	-----	2	2
8 MP det, stockadc (NA, 2 NB)-----	19-500R	19	-----	1	1
9 MP det, crim inves (MD)-----	19-500R	12	1	-----	3
10 MP det, crim inves (MF)-----	19-500R	25	-----	1	1

(b) Schematic diagram—military police units.



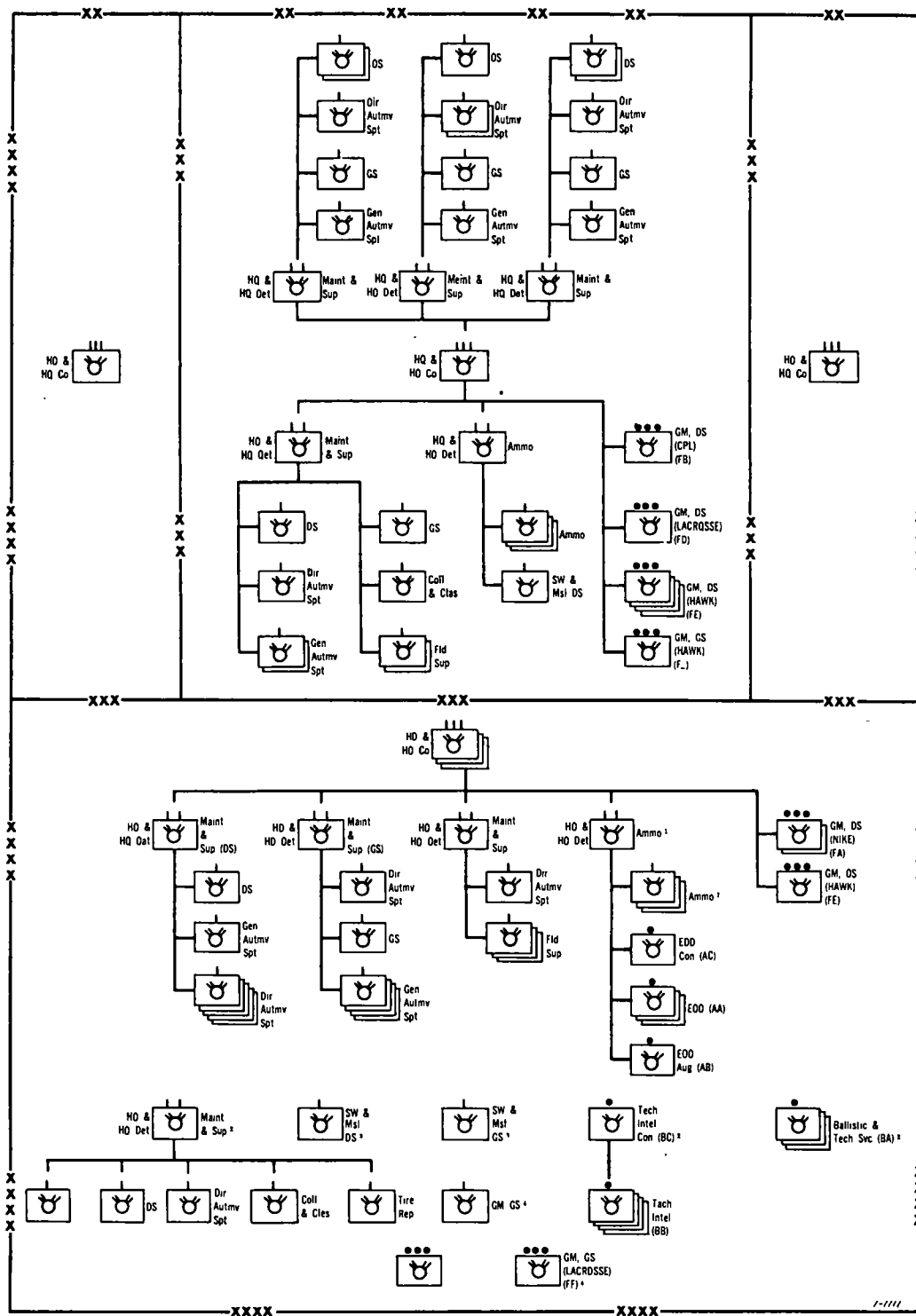
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4.2

(10) *Ordnance units.*

(a) *Numbers and types—ordnance units.*

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
HQ & HQ co, ord gp-----	9-12P	100	1	3	6
HQ & HQ det, ord maint and sup bn--	9-76D	37	4	10	22
HQ & HQ det, ord ammo bn-----	9-86D	72	1	3	6
Ord ammo co-----	9-17D	263	3	9	18
Ord dir autmv spt co-----	9-127D	123	5	22	37
Ord DS co-----	9-7D	181	6	4	22
Ord fld sup co-----	9-57D	158	2	9	15
Ord SW and msl DS co-----	9-47D	246	1	1	4
Ord SW and msl GS co-----	9-87D	184	-----	1	1
Ord GS co-----	9-9D	201	4	3	15
Ord gen autmv spt co-----	9-197D	185	5	15	30
Ord park co-----	9-137D	165	-----	1	1
Ord coll and clas co-----	9-167D	167	1	1	4
Ord tire rep co-----	9-117T	157	-----	1	1
Ord GM GS co-----	9-227D	160	-----	1	1
Ord det, ballistic and tech svc (BA)---	9-510R	7	-----	3	3
Ord det, EOD (AA)-----	9-510R	10	-----	9	9
Ord det, EOD, aug (AB)-----	9-510R	14	-----	3	3
Ord det, EOD, con (AC)-----	9-510R	8	-----	3	3
Ord det, GM, DS (CPL) (FB)-----	9-510R	24	1	-----	3
Ord det, GM, DS (NIKE-AJAX/ HERCULES) (FA)-----	9-510R	44	-----	6	6
Ord det, GM, DS (LACROSSE) (FD)---	9-510R	35	1	-----	3
Ord det, GM, DS (HAWK) (FE)-----	9-510T	40	4	3	15
Ord det, GM, GS (LACROSSE) (FF)---	9-510T	28	-----	1	1
Ord det, GM, GS (HAWK) (F-)-----	9-510P	32	1	1	4
Ord det, tech intel (BB)-----	9-510R	6	-----	4	4
Ord det, tech intel, con (BC)-----	9-510R	11	-----	1	1

(b) Schematic diagram—ordnance units.



¹ The number of ammunition battalions and companies depends upon tonnages to be handled and lifts involved.

² Normally attached to a headquarters and headquarters company, ordnance group, in the field army service area.

³ Normally attached to a headquarters and headquarters detachment, ordnance ammunition battalion, in the field army service area.

⁴ Normally attached to a headquarters and headquarters detachment, ordnance maintenance and supply battalion, in the field army service area.

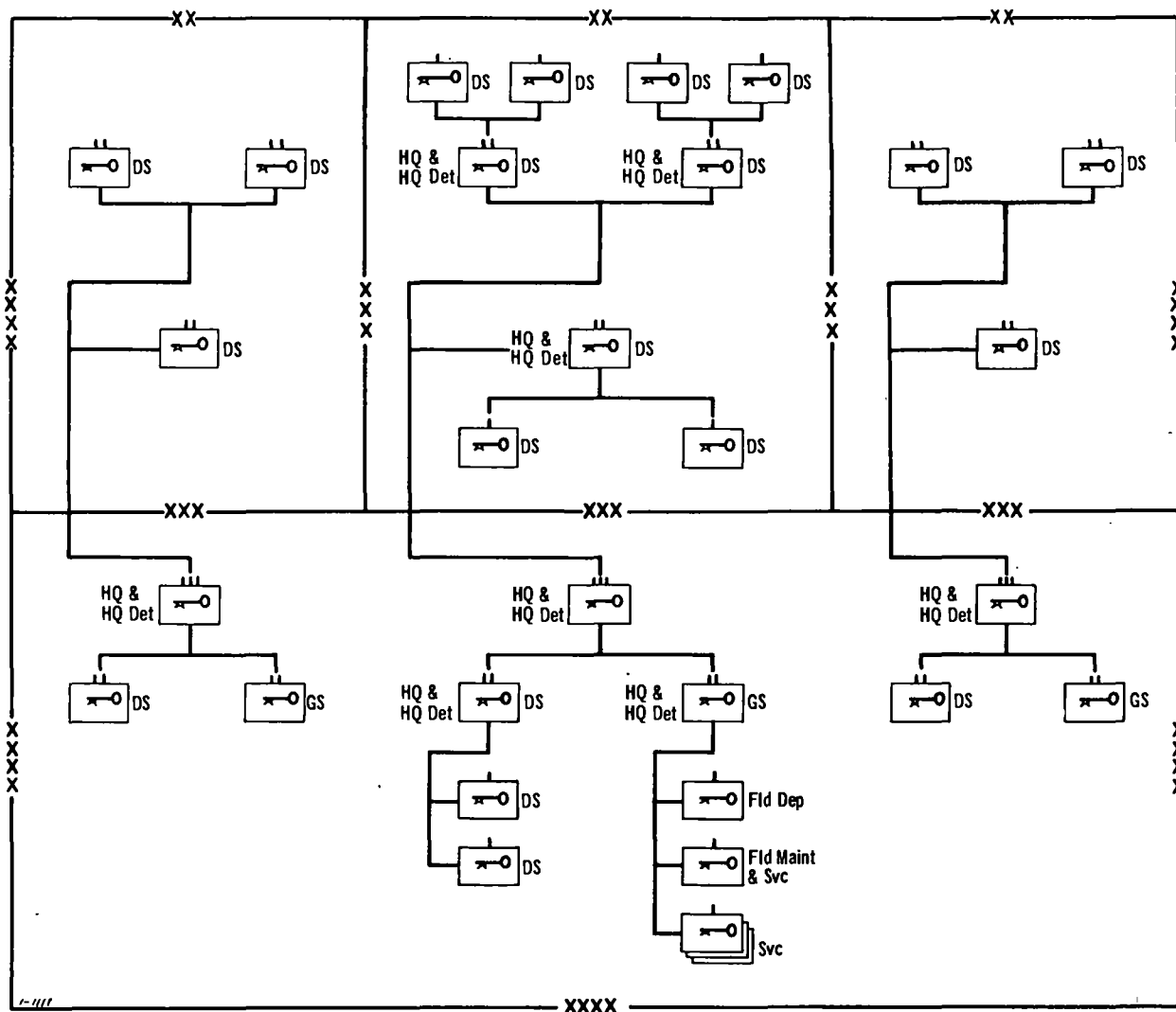
(11) Quartermaster units.

(a) Numbers and types—quartermaster units.

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
2	HQ & HQ det, QM gp.....	10-22D	34	¹ 1	-----	3
3	QM DS bn.....	10-105P	611	3	3	12
4	HQ & HQ det, QM DS bn.....	10-106P	(33)	(3)	(3)	(12)
5	QM DS co.....	10-107P	(289)	(6)	(6)	(24)
6	QM GS bn.....	10-445P	1,073	-----	3	3
7	HQ & HQ det, QM GS bn.....	10-446P	(34)	-----	(3)	(3)
8	QM fld dep co.....	10-447P	(271)	-----	(3)	(3)
9	QM fld maint and svc co.....	10-448P	(273)	-----	(3)	(3)
10	QM svc co.....	10-449P	(165)	-----	(9)	(9)

¹ One per corps slice.

(b) Schematic diagram—quartermaster units.



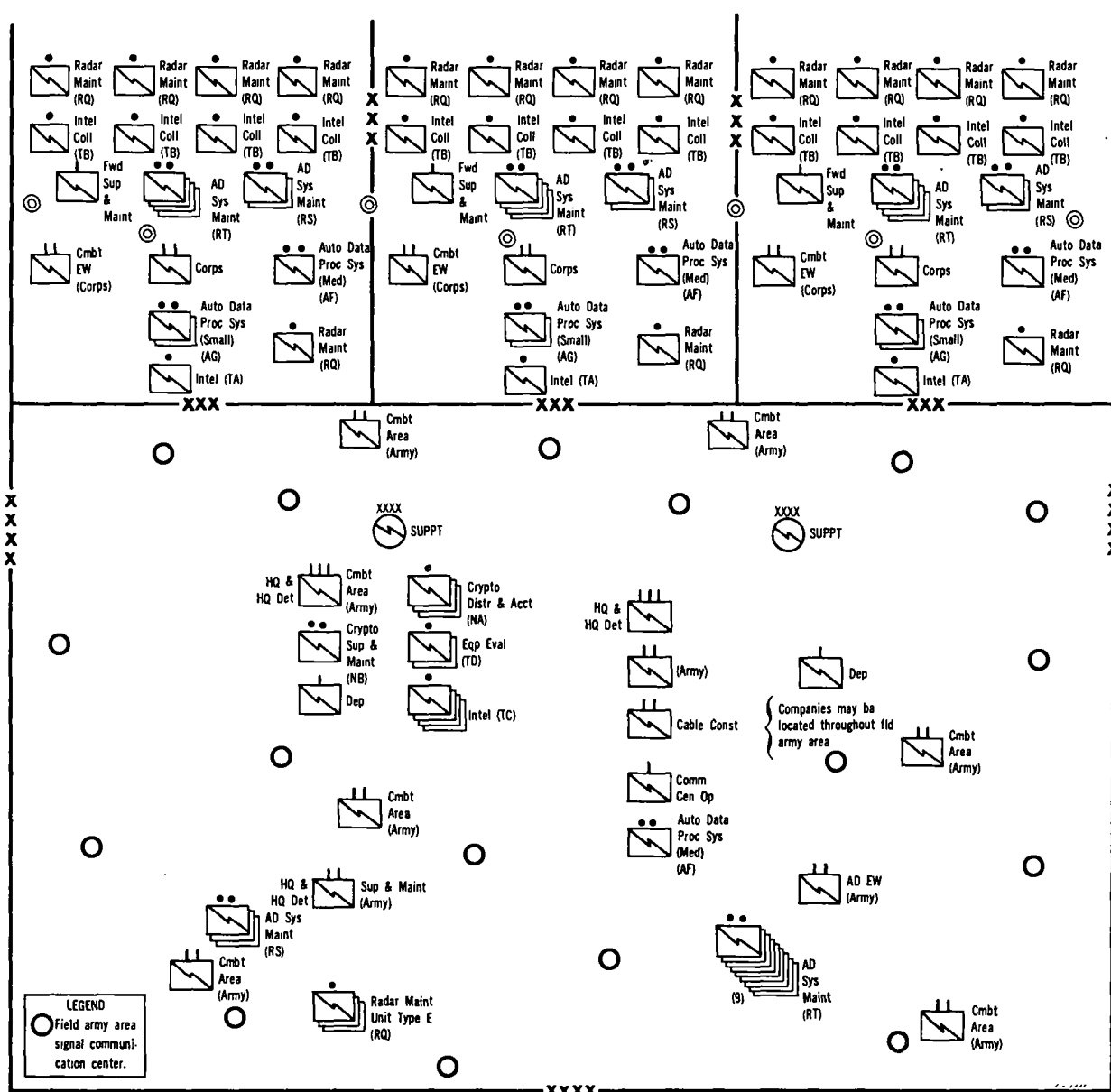
(12) *Signal units.*

(a) *Numbers and types—signal units.*

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
HQ & HQ det, sig gp.....	11-22D	39	-----	1	1
HQ & HQ det, cmbt area sig gp, army..	11-32D	63	-----	1	1
Army sig bn.....	11-95D	1,114	-----	1	1
Cmbt area sig bn, army.....	11-85D	810	-----	6	6
Sig cable const bn.....	11-45D	875	-----	1	1
Army sig sup and maint bn (aug).....	11-155D	876	-----	1	1
Corps sig bn or sig bn, abn corps.....	11-15D	691	1	-----	3
HQ & HQ det, cmbt EW sig bn, corps..	11-66D	42	1	-----	3
Cmbt EW sig co, inf.....	11-67D	165	3	-----	9
Cmbt EW sig co, armd.....	11-68D	140	1	-----	3
AD EW sig bn, army.....	11-165D	1,071	-----	1	1
Sig comm cen op co.....	11-137D	291	-----	1	1
Sig det, auto data proc sys (med) (AF)...	11-500P	24	1	1	4
Sig det, auto data proc sys (small) (AG)	11-500P	17	2	-----	6
Sig det, crypto distr and acctg (NA)...	11-500R	6	-----	3	3
Sig det, crypto sup and maint (NB)...	11-500R	13	-----	1	1
Sig det, intel off sec (TA).....	11-500R	3	1	-----	3
Sig det, intel coll (TB).....	11-500R	4	1 4	-----	12
Sig det, intel off sec (TC).....	11-500R	5	-----	4	4
Sig det, eqp eval (TD).....	11-500R	4	-----	2	2
Sig det, radar maint unit, type E (RQ)...	11-500R	6	-----	18	18
Sig det, AD sys maint (ADA gp) (RS)...	11-500R	19	-----	9	9
Sig det, AD sys maint (ADA bn) (RT)...	11-500R	12	-----	21	21

¹ One per division.

(b) Schematic diagram—signal units.



(13) *Transportation units.*

(a) *Numbers and types—transportation units.*

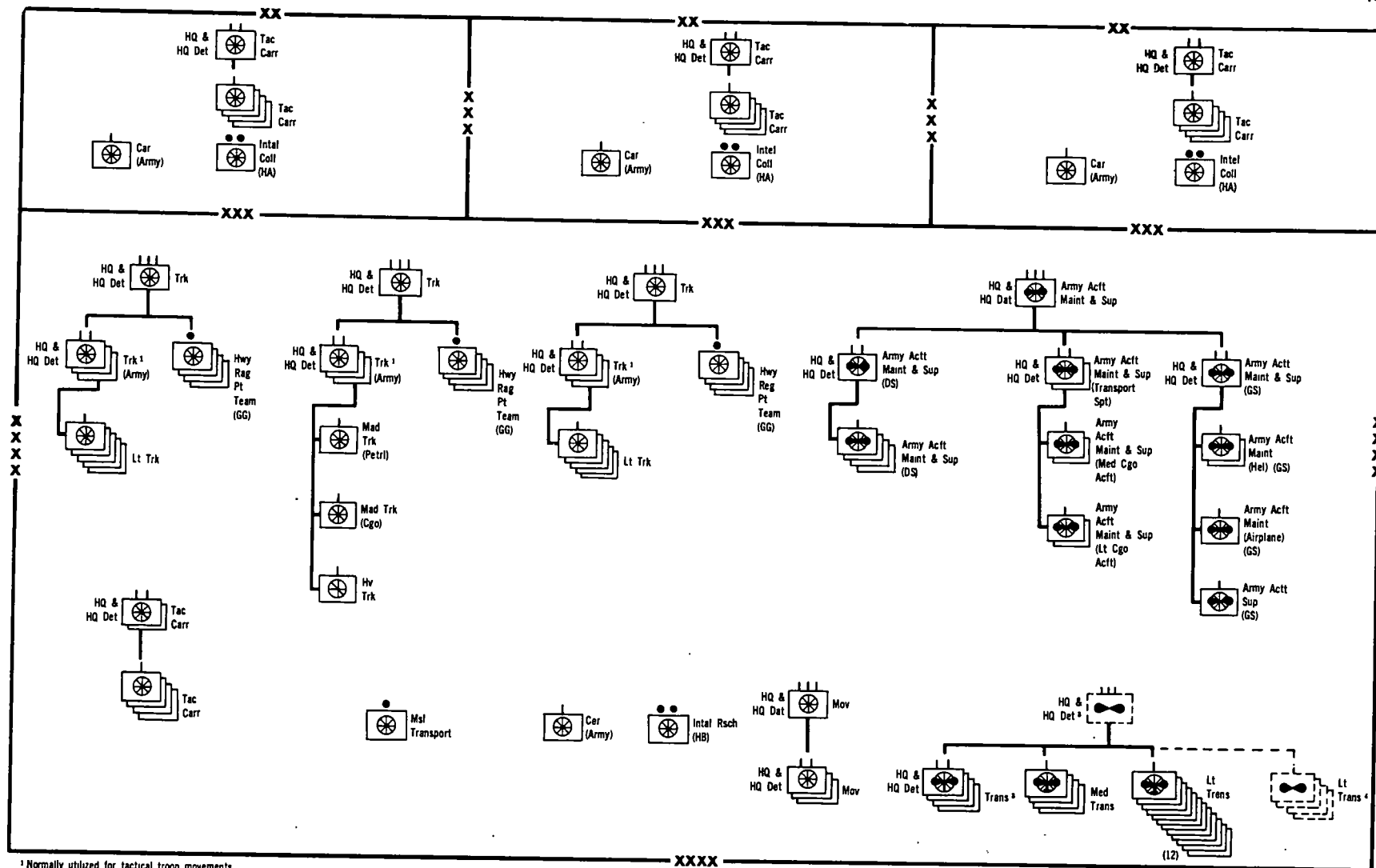
1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
HQ & HQ det, trans Army acft maint and sup gp.....	55-452P	77	-----	1	1
HQ & HQ det, trans Army acft maint and sup bn, DS.....	55-456P	57	-----	1	1
HQ & HQ det, trans Army acft maint and sup bn, transport spt.....	55-456P	57	-----	2	2
HQ & HQ det, trans Army acft maint and sup bn, GS.....	55-456P	57	-----	1	1
Trans Army acft maint and sup co, DS.....	55-457P	156	-----	4	4
Trans Army acft maint and sup co, med cgo acft.....	55-468P	166	-----	4	4
Trans Army acft maint and sup co, lt cgo acft.....	55-469P	252	-----	4	4
Trans Army acft sup co, GS.....	55-477P	117	-----	1	1
Trans Army acft maint co, airplane, GS.....	55-478P	264	-----	1	1
Trans Army acft maint co, hel, GS.....	55-479P	239	-----	2	2
HQ & HQ det, trans trk gp.....	55-12D	61	-----	3	3
HQ & HQ det, trans trk bn.....	55-16D	47	-----	9	9
HQ & HQ det, trans mov gp (AE, LF) -- (CA, DA, DC).....	55-500R 29-500D	64	-----	1	1
HQ & HQ det, trans mov bn (AD, LA, 2 LE, 3 LC, 3 LD).....	55-500R	67	-----	3	3
Trans car co, army.....	55-19D	110	1	1	4
Trans hv trk co (aug).....	55-28C	216	-----	3	3
Trans lt trk co (5-ton) ¹ ²	55-17D	181	-----	30	30
Trans med trk co (cgo) ³	55-18D	187	-----	3	3
Trans msl transport sqd.....	55-18D	11	-----	1	1
Trans med trk co (petrl) ³	55-18D	193	-----	3	3
Trans highway reg pt team (GG).....	55-500R	8	-----	12	12
Trans intel coll team (HA).....	55-500R	12	1	-----	3
Trans intel rsch team (HB).....	55-500R	14	-----	1	1
HQ & HQ det, trans tac carr bn.....	55-46D	55	1	2	5
Trans tac carr co.....	55-47D	180	4	8	20
HQ & HQ det, trans transport acft bn.....	55-56D	72	-----	4	4
Trans lt hel co.....	55-57D	147	-----	12	12
Trans med hel co.....	55-58T	178	-----	4	4

¹ May be equipped with either 5-ton or 2½-ton cargo trucks. When equipped with the 2½-ton truck, the aggregate strength is 168

² Augmented by 1 DG (EM 1) and 4 DE (EM 1 each) teams from TOE 29-500D.

³ Augmented by 2 DG (EM 1 each) and 4 DE (EM 1 each) teams from TOE 29-500D.

(b) Schematic diagram—transportation units.



¹ Normally utilized for tactical troop movements.

² Pending Department of the Army approval and publication as either 1-series or 55-series TOE, headquarters and headquarters detachment, aviation group, is included with Army aviation units (12) above to avoid duplication. Unit is portrayed in above diagram to illustrate employment of attached elements.

³ Battalion has the capability of controlling two to seven companies and is tailored as required by the mission.

⁴ 1-series TOE.

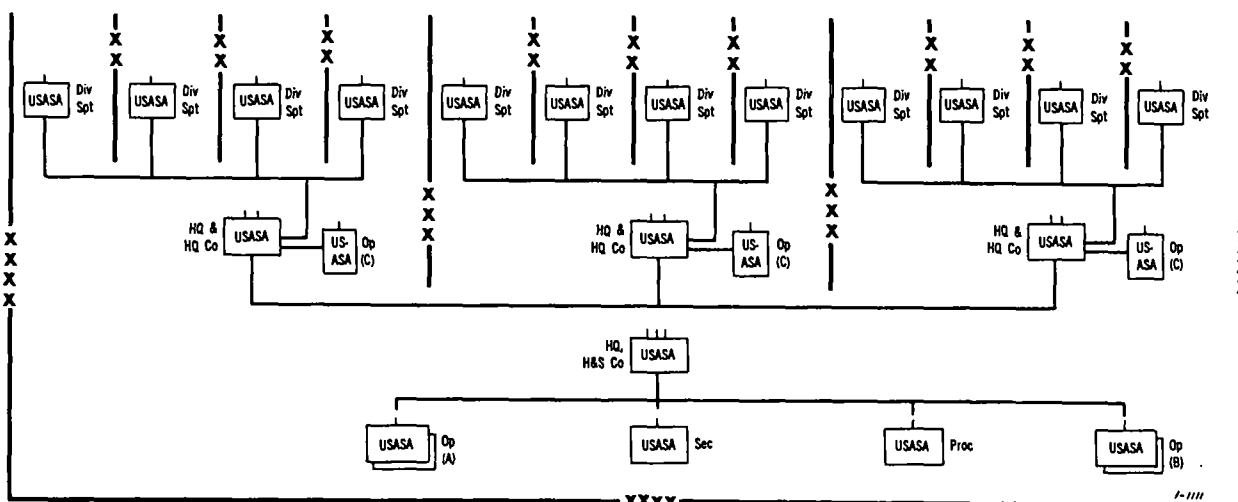
(14) U.S. Army Security Agency units.*

(a) Numbers and types—U.S. Army Security Agency units.

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
HQ, H&S co, USASA gp.....	32-52P	220	-----	1	1
HQ & HQ co, USASA bn.....	32-56P	191	1	-----	3
USASA op co (A).....	32-67P	339	-----	2	2
USASA op co (B).....	32-68P	279	-----	2	2
USASA op co (C).....	32-69P	153	1	-----	3
USASA proc co.....	32-77P	176	-----	1	1
USASA sec co.....	32-78P	135	-----	1	1
USASA div spt co.....	32-57P	196	1 4	-----	12

* One per division.

(b) Schematic diagram—U.S. Army Security Agency units.



(15) Miscellaneous—numbers and types.

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
<i>Headquarters</i>					
HQ, army (aug).....	51-1C	1,105	-----	1	1
HQ co, army.....	51-2C	139	-----	1	1
HQ, sp trp, army.....	51-3C	18	-----	1	1
HQ, corps or abn corps.....	52-1C	249	1	-----	3
HQ co, corps or abn corps.....	52-2C	66	1	-----	3
Med det, corps or abn corps.....	52-2C	8	1	-----	3

* For data pertaining to radio communications equipment, see FM 101-10, part III, paragraph 4.11.

FM 101-10
PART I
4.2

1	2	3	4	5	6
Unit	TOE	TOE strength	Corps	Field army	Total field army
<i>Replacement Units</i>					
8 HQ & HQ det, repl gp.....	20-52C	53		1	1
9 HQ & HQ det, repl bn.....	20-56C	55	1	1	4
10 Repl co.....	20-57C	32	4	4	16
<i>Adjutant General</i>					
11 APU type F.....	12-605D	16		14	14
12 APU type J.....	12-605D	35		1	1
13 Data proc unit type Z (mbl) (aug).....	12-510D	69		3	3
14 Data proc unit type Z (consol aug) (mbl).....	12-510D	78		1	1
15 Army band (42-piece).....	12-107D	43	1	1	4
16 Army band (28-piece).....	12-107D	29		3	3
17 Pstl reg det.....	12-47D	43		2	2
18 SPS co.....	12-17D	103	1.25		3.75
<i>Finance</i>					
19 Fin disb sec (AC, FL, GA, HB).....	14-500D	31	3	9	18
<i>Civil Affairs</i>					
20 CA gp (AC, FD, GC, HB, IC, KB, LB, BA, BE, MC, NC, OB, PD, QB, RB, SB, TA, VA, VC, WC, XB).....	41-500D	169		1	1
(CA, 2 CB, DA, DC, DE).....	29-500D				
21 CA co (AB, 10 AA, 10 FA, BE, FB, GB, IA, BA, MB, NA, NB, OA, PC, QA, RA, SA, VA, WB).....	41-500D	171	1		3
(CA, 2 CB, DA, DC, 2 DE, DG).....	29-500D				
22 CA plat (div) (AA, BA, FA, BD, MA, NA, VA).....	41-500D	22	4		12
<i>Judge Advocate General Corps¹</i>					
23 JAGC det HQ team (AA).....	27-500D	4	1	3	6
24 JAGC det HQ team (AB).....	27-500D	9		1	1
25 JAGC claims svc team (FA).....	27-500D	4	3	3	12
26 JAGC claims svc team (FB).....	27-500D	10		2	2
27 JAGC war crimes team (GA).....	27-500D	4	3	3	12
28 JAGC war crimes team (GB).....	27-500D	5		2	2
29 JAGC GCM trial team (HA).....	27-500D	6	2	4	10
30 JAGC GCM trial team (HB).....	27-500D	10	2	3	9
31 JAGC legal asst team (IA).....	27-500D	3	2	4	10
32 JAGC legal asst team (IB).....	27-500D	4		1	1
<i>Special Warfare</i>					
33 Psych warfare loudspeaker and leaflet co.....	33-77D	97		1	1
34 Psych warfare consol co (AC, 3 AA, 3 FA, 12 HA, 3 IA, KA, 3 MA).....	33-600D	96		1	1

	1	2	3	4	5	6
1	Unit	TOE	TOE strength	Corps	Field army	Total field army
	<i>Historical</i>					
35	Mil hist det-----	20-17D	2	4	-----	12
	<i>Public Information</i>					
36	Pub info op team (BA)-----	45-500D	2	1	-----	3
37	Cmbt correspondent team (BD)-----	45-500D	1	4	-----	12
38	Pub info op team (aug) (BE)-----	45-500D	5	1	-----	3
39	Pub info op team (aug) (BF)-----	45-500D	3	1	1	4
40	Press camp HQ team (AA)-----	45-500D	7	-----	1	1

¹ Not basis for automatic allocation.

4.3. Troop Requirements—Theater Army Logistical Command

a. There is no prescribed organization or *type* composition for the theater army logistical command. The theater army logistical command troop list should be specifically tailored to efficiently perform the minimum essential support functions. Factors which influence the support structure in the theater army logistical command are as follows:

- (1) *Mission.* The mission of the theater determines in a large measure the load which will be placed on the theater army logistical command.
- (2) *Supported strength.* The total strength to be supported, both combat zone and theater army logistical command personnel, influences both the size and types of support which must be provided. Included in these strength considerations must be the support requirements for Air Force, Navy (including Marine), Allied troops, and civil affairs personnel.
- (3) *Troop availability.* The availability of service troops and supporting equipment will influence theater army logistical command organization.
- (4) *Geography, climate, and cultural development.* These factors affect the support levels required for the efficient conduct of military operations. Fa-

vorable climate and terrain tend to decrease many service requirements; whereas, cultural developments may increase or decrease requirements, depending on the nature of military operations conducted.

- (5) *Concept of administrative support.* Just as the mission of the theater determines the load placed on the theater army logistical command, the administrative support concept employed will determine the efficiency of support services.

b. For data pertaining to the numbers and types of nondivisional technical and administrative service units which might be found within the communications zone, see FM 101-10, part III, paragraph 4.2. For data pertaining to the normal assignment, capabilities, and strengths of nondivisional technical and administrative service units, see FM 101-10, part II.

4.4. Troop Requirements—Airborne Operations

a. *General.*

- (1) Troop requirements for an airborne force are determined by the mission, the terrain and weather in the objective area, enemy dispositions and capabilities, availability of aircraft, probable length of time the airborne force must be supported by air lines of com-

munications, the availability of administrative support, and other pertinent factors. The complete dependence of an airborne force on a single communication system—air lines of communication—until surface link-up is established requires that troop requirements be very carefully determined for each airborne operation being planned.

- (2) Normally the troop list for the Army component of an airborne force includes those units that will be directly employed in the operation in a combat or supporting role. It does not include units required to support the marshaling of the Army forces or the administrative support that may be furnished by the theater army logistical command agency designated to mount and support the airborne operation.
- (3) The number of airborne divisions and corps allocated to theaters of operation will vary. Such units will be furnished by the Department of the Army based on Joint Chiefs of Staff directives.
- (4) The Army component of an airborne force is usually responsible for its own administrative support in the airborne objective area, regardless of the size or composition of the Army forces. Therefore, the troop list for the Army component of an airborne force will contain sufficient service troops to provide administrative support in the airborne objective area. In all airborne operations, the provision of service support to the Army forces in the objective area by units located in the departure area will be carefully considered and used to the maximum extent permitted by the characteristics of the operation being planned. Usually the nature of the service provided by the units concerned will determine whether they will be assigned to the Army component of the airborne force or to the theater army logistical

command supporting the operation. Normally the number of Army service troops required in an airborne objective area will be considerably less than the number employed by a ground force containing the same number of divisions.

b. Employment of TOE Units. The same types of nondivisional combat and service troops shown for the type field army in paragraph 4.2 will be used to support airborne divisions, infantry divisions, corps, and field armies used in airborne operations. The number of supporting units used will be scaled down to provide only the requirements of the specific force being organized. Frequently the strength and organic equipment of a supporting unit will be reduced to enhance its air transportability. Lighter equipment may be substituted for heavy equipment. Because of the inherent differences between ground and airborne operations, many of the units shown in paragraph 4.2 may be omitted from the airborne troop list, while others may be assigned to the theater army logistical command agency supporting the airborne operation. Of those units assigned to the Army component of the airborne force, a portion may operate within the objective area, while others will support the operation from the departure area.

c. Employment of Special Units. Special units or TOE units with special training and equipment are required for certain airborne operations, particularly those of the independent type.

- (1) Specifically tailored, trained, and equipped engineer units organized primarily around the engineer light equipment company and the engineer combat battalion (army) are required when airfields are to be rehabilitated or air-landing facilities constructed.
- (2) Specially organized, trained, and equipped units are required to provide air terminal facilities in the objective area when large tonnages of supplies and equipment will be delivered by air for a prolonged period. Normally this

support will be provided by Air Force units.

- (3) The numbers and types of the special units required will be determined separately for each airborne operation, based on such factors as the airfield repair and construction requirements in the objective area, the tonnage of supplies and equipment to be received in the objective area via air transportation, and the method of supply distribution that will be used in the objective area.

4.5. Troop Requirements—Amphibious Operations

The table below is designed for use in determining the units required in addition to the units normally attached to battle group landing teams (BGLT), divisions, and corps to provide balanced shore parties for an amphibious operation. Troop assignment (in the table) is based on a corps with three divisions in the assault. The factors used as a basis for determining the troop requirements can only be used to provide an estimate of requirements. Modifications and adjustments must be made to meet the peculiarities of a particular situation.

A Type Shore Party Troop List

1	2	3	4	5
Unit	TOE	Per BGLT ^{1 2}	Per Inf div ^{1 2}	Per corps ^{1 2}
Engineer units:				
HQ & HQ co, engr amph spt comd ³	5-601			1
Engr cmbt bn, army	5-35		1	5
Engr cmbt co, army	5-37	1		
Engr fld maint co	5-157			1
Det, engr fld maint co	5-157		1	
Svc spt bn, engr amph spt comd ^{3 4}	5-605			1
Maint det, DS co, svc spt bn	5-607		1	
Engr amph bn, engr amph spt comd ^{3 4}	5-625			1
Engr amph co	5-627		1	
Engr amph cqp bn, engr amph spt comd ^{3 4}	6-615			1
Engr amph eqp co	5-617		1	
Plat, engr amph cqp co	5-617	1	4	
Engr LE co	5-367			
Engr SUPPT co	5-48			1
Chemical units:				
Cml smoke genr bn:				
HQ & HQ det, cml smoke genr bn	3-266		1	3
Cml smoke genr co	3-267	1		
Cml co, cmbt spt	3-7			1
Plat, cml co, cmbt spt	3-7		1	
Medical units:				
Med co, svc spt bn, engr amph spt comd ^{3 4}	8-609			1
Plat, med co, svc spt bn	8-609		1	
Med bn, sep:				
HQ & HQ det, med bn, sep	8-26			1
Med coll co	8-129		1	3
Med holding co	8-57			1
Med amb co	8-127		1	3
Med air amb co	8-137			1

See footnotes at end of table.

A Type Shore Party Troop List—Continued

1	2	3	4	5
Unit	TOE	Per BGLT ^{1 2}	Per Inf div ^{1 2}	Per corps ^{1 2}
Ordnance units:				
Ord gp:				
27 HQ & HQ co, ord gp.....	9-12			1
Ord maint and sup bn:				
28 HQ & HQ det, ord maint and sup bn.....	9-76		1	4
29 Ord DS co.....	9-7		1	5
30 Ord dir autmv spt co.....	9-127		1	4
31 Ord fld sup co ⁵	9-57			3
32 Ord tech intel det (BB).....	9-510		1	3
33 Ord GM DS and GS dets ⁵	9-510		As required	
Ord ammo bn:				
34 HQ & HQ det, ord ammo bn.....	9-86			1
35 Ord ammo co.....	9-17		1	4
36 Ord SW and msl DS co.....	9-47			1
37 Stor and iss plat, ord SW and msl DS co.....	9-47		1	
38 EOD det (AA).....	9-510		1	3
Signal units:				
39 Sign co, svc spt bn, engr amph spt comd ^{3 4}	11-608			1
40 Gp sig spt plat, sig co, svc spt bn.....	11-608		1	
41 Sign fwd sup and maint co, army sig sup and maint bn.....	11-157			1
42 Det, sig fwd sup and maint co.....	11-157		1	
43 Sig co, sep.....	11-500			1
44 Plat, sig co, sep.....	11-500		1	
Quartermaster units:				
45 QM svc co.....	10-449		2	8
46 Plat, QM svc co.....	10-449	1		
47 QM DS bn.....	10-105		1	4
48 Petrl sec, QM DS co, QM DS bn.....	10-107		1	3
Transportation units:				
Trans boat bn:				
49 HQ & HQ co, trans boat bn.....	55-126		1	4
50 Trans lt boat co.....	55-127		1	3
51 Trans med boat co.....	55-128	1	3	9
52 Trans hv boat co ⁵	55-129			1
53 Trans fltg craft dep maint co.....	55-157			1
54 Trans HARCFT unit ⁵	55-500			1
Trans trk bn:				
55 HQ & HQ det, trans trk bn.....	55-16		1	3
56 Trans lt trk co.....	55-17		1	3
Trans terminal bn:				
57 HQ & HQ det, trans terminal bn.....	55-116			3
58 Trans terminal svc co.....	55-117		1	6
59 Trans amph trk co.....	55-137		1	5
60 Plat, trans amph trk co.....	55-137	1		
61 Trans acft DS co.....	55-457			1
62 Trans mov bn (AD, LA, 2 LE).....	55-500			1
63 Trans mov dets (3 LC, 3 LD).....	55-500		6	18
Military police units:				
64 MP bn.....	19-35		1	3
65 MP co.....	19-37		2	
66 Plat, MP co.....	19-37	1		

See footnotes at end of table.

A Type Shore Party Troop List—Continued

1	2	3	4	5
Unit	TOE	Per BGLT ^{1 2}	Per Inf div ^{1 2}	Per corps ^{1 2}
67 MP ESCRG co.....	19-47		1	
68 Plat, MP ESCRG co.....	19-47	1		
Navy units:				
69 Nav beach gp.....	USN		1	3
70 Aslt det, nav beach gp.....	USN	1		
71 Air Force units.....			(6)	(6)

¹ TOE units shown under columns 4 and 5 can be broken down and assigned to support subordinate commands as the situation may require.

² Figures in column 4 include those in column 3, figures in column 5 include those in column 4

³ Units organic to the engr amph spt comd

⁴ Detachments may be attached to a division when the engr amph spt comd headquarters is not employed.

⁵ Units usually attached to divisions.

⁶ Air Force service elements to support Air Force units with the landing force.

4.6. Troop Planning Slices

a. *Purpose.* In administrative planning, a preliminary estimate of the total size of a force is required to determine the final composition and the ultimate size of the force, since the required number of many service units, such as hospitals, depot units, etc., bears a direct relationship to the size of the total force. Two factors are used in such planning, the *division slice* and the *wing slice*. To determine the preliminary total of the force, multiply the division slice by the number of divisions in the force and add the product thus obtained to that of the wing slice multiplied by the number of wings in the force; to the sum thus obtained must be added the various miscellaneous forces not included in either slice.

b. Definitions.

- (1) The *division slice* includes the strength of an average combat division plus proportionate shares of the total corps, field army, communications zone, and CONUS (for worldwide slice only) units operating to the rear of the division (and of Naval units directly supporting the Marines in case of Marine divisions). The division slice for any given force is equal to the total strength of the force divided by

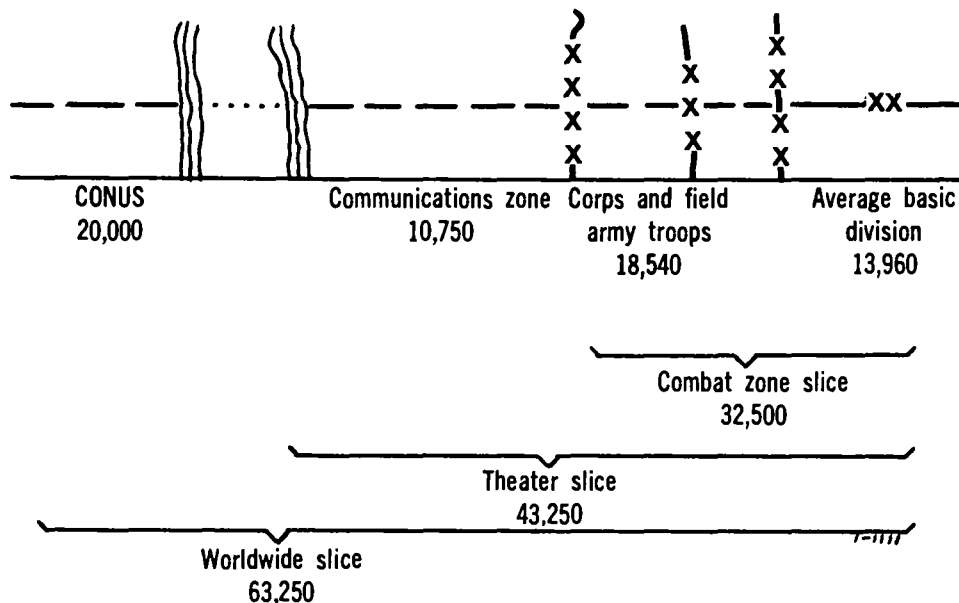
the number of combat divisions in the force.

- (2) The *wing slice* includes the strength of an average wing plus a proportionate share of the Air Force and Army units engaged in developing or operating the airbases (and of Naval units which directly support the Marine or Naval air units).

c. *Relation Between Division Slice and Wing Slice.* The 7,000-man wing slice includes about 1,000 Army communications zone men not counted in a division slice. These 1,000 Army men are required for communications zone support of Air Force units and installations present in the theater of operations. In the charts in *d* below, and also in *a* and *b* above, this same assumption is made—the wing slice and not the division slice contains the communications zone support for Air Force. This allows troop planners to use these tables with varying ratios of air wings to Army divisions in any specific force.

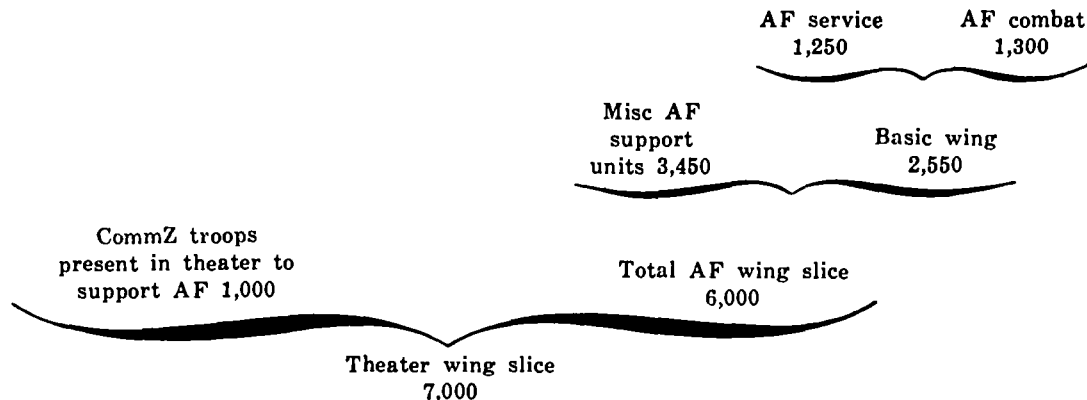
d. *Basic Slice Factors.* (See par. 5.49 and 9.2 for location of slice components as contrasted with assignment of slice components shown here.)

- (1) *Division slice* (U.S. Army troops only).



(2) *Wing slice* (U.S. Air Force combat service and support troops and U.S. Army troops present, because Army

supports Air Force in certain functions):



4.7. Division and Wing Slices

a. Division Slice. The following table presents the percentages of each arm, service, and other major grouping in each part of a large balanced force. It is based on troop deployment at the end of World War II. This troop deployment contained 89 divisions—5 airborne, 16 armored, 1 cavalry, 66 infantry, and 1 mountain. This table has been modified to conform to the current type field army, current divisions

and the consolidation of all artillery in one arm, the consolidation of cavalry, armored, and tank destroyer units into one armor branch, the transfer of certain truck and car units from Quartermaster Corps to Transportation Corps, and the separation of the Air Force from the Army. The communications zone column does *not* include those Army communications zone troops who must be present to support the Air Force (par. 4.6b and c).

Division Slice

1	Branch or other major groupings	Worldwide slice		Theater slice		Combat zone slice		Average division only (13,960 men)
		Total (63,250 men)	CONUS portion (20,000 men)	(Army)		(Army)		
				Total (43,250 men)	CommZ portion (10,750 men) ¹	Total (32,500 men) ²	Corps, fld army and rear portion (18,540 men) ³	
2	Combat division	22.1	0.0	32.3	0.0	43.0	0.0	100.0
3	HQ units, AG, FD, and other administrative and intelligence services including operating overheads (including for CONUS defense command overheads and DA agencies).	5.5	9.5	3.7	8.4	2.6	4.6	0.0
4	Armor	3.5	0.3	5.2	0.1	6.2	10.9	0.0
5	Artillery	9.2	1.6	13.6	0.1	17.2	30.9	0.0
6	Aviation					1.1	2.0	
7	Chemical	0.5	0.2	0.6	0.7	0.6	1.0	0.0
8	Engineer	7.7	4.0	9.0	12.0	8.6	15.0	0.0
9	Infantry	1.5	0.4	2.3	0.2	1.7	2.9	0.0
10	Medical	5.9	4.9	6.5	16.0	3.9	6.8	0.0
11	Military police	1.1	0.9	1.2	2.0	1.1	1.9	0.0
12	Ordnance	5.0	1.8	6.0	6.9	5.3	9.1	0.0
13	Quartermaster	4.7	2.6	5.6	14.7	2.8	4.9	0.0
14	Signal	3.8	1.7	4.3	7.0	3.1	5.2	0.0
15	Transportation	5.6	5.0	6.0	16.2	2.8	4.8	0.0
16	Replacements	10.0	23.0	3.7	¹ 15.7	³ (2.3)	³ (4.9)	0.0
17	Bulk pers CONUS only	8.8	27.9	0.0	0.0	0.0	0.0	0.0
18	Misc CONUS only	5.1	16.2	0.0	0.0	0.0	0.0	0.0
19	Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0
20	Percentage of worldwide slice	100.0	31.6	68.4	17.0	51.4	29.3	22.1
21	Percentage of theater slice			100.0	24.8	75.2	42.9	32.3
22	Percentage of combat zone slice					100.0	56.9	43.0

¹ Includes replacements in field army areas.

² Does not include replacements.

³ Not included in field army percentage total.

b. *Wing Slice.* This table presents the percentages of components, branch, and other major groupings present in the theater of op-

erations. It is based upon a hypothetical USAF troop list and a hypothetical Army force.

Theater Wing Slice

	1	2	3	4
1	Component, branch, or other major grouping	Theater total— 7,000 men (percentage)	Air Force total— 6,000 men (percentage)	Basic wing 2,550 men— (1,300 combat) (1,250 service) ¹ (percentage)
2	Air Force:			
3	HQ and overhead ²	(3.0)	(3.3)	
4	Combat.....	18.6	21.7	51.0
5	Service.....	17.9	20.8	49.0
6	Misc support.....	49.2	57.5	
7	Army:			
8	COMMZ support.....	14.3		
9	Total percentage.....	100.0	100.0	100.0
10	Percentage of wing slice.....	100.0	85.7	36.4

¹ Located on the combat airfield; includes all elements organic to wing.

² Includes various Air Force headquarters and miscellaneous overhead units. Percentages in parentheses are included within total percentages of miscellaneous support, line 5.

Army Communications Zone Support by Service

	HQ and misc overhead	Cinl	Engr	Med	Ord	QM	Sig	Trans	Total
Percentage of 1,000 men.	10	2	22	20	5	16	8	17	100

Section II. TACTICAL TROOP MOVEMENTS

4.8. General

a. Introduction. The examples of forms for movement tables and graphs are included as guides for the preparation of similar tables for units in the field. Tables for field use must conform to the variations of strength of units and the amount of transportation and equipment available. Battle groups, separate battalions, and similar units should maintain tables showing road space requirements of their units, based on actual strength and materiel on hand. Reports of subordinate units form the basis for tables of larger units. However, a table based on actual strength of men and materiel may be worthless without proper evaluation of the weather, road conditions, hostile air and mechanized threats, or other variable factors affecting the troop movement. These basic figures are

capable of great increase or decrease under extremes of the variable factors. Troop movement data as given in the examples of tables of basic road spaces and tables of rates and lengths of marches are average from field experience.

b. Basic Road Spaces. The following values apply in computing road spaces, except when greater dispersion is desired to reduce the effect of unfavorable factors such as those mentioned in *a* above:

(1) *Foot troops (at halt or marching):*¹

	2 yd per man	5 yd per man
Single file, per man.....	2.4	5.4
Columns of twos, per man..	1.2	2.7

¹ For time length of foot elements in column, see *d* below. Factors do not include normal distances between units.

(2) *Motor elements (at halt):*²

	Road space (yd) ³
Car, passenger -----	8
Armored personnel carrier -----	8
Tank -----	8
Tank, with cargo carrier or weapon in tow -----	11
Tractor -----	7
Tractor, with cargo trailer or weapon in tow -----	15
Tractor, 5-ton, with semitrailer, 15-ton, low-bed -----	30
Tractor, 10-ton, with semitrailer, tank transporter, 50-ton -----	30
Trucks:	Road space (yd) ³
¼-ton -----	5
¼-ton, with cargo trailer or weapon in tow -----	8
½- or ¾-ton -----	6
½- or ¾-ton, with cargo trailer or weapon in tow -----	10
2½-ton -----	9
2½-ton, with cargo trailer or weapon in tow -----	16
Over 2½-ton -----	9
Over 2½-ton, with cargo trailer in tow -----	13
6-ton cargo (treadway) -----	14
Average per vehicle for a mixed column of various types -----	10

(3) *Use of values.*

- (a) A dismounted battle group of 1,000 men organized as 7 companies, totaling 27 platoons; company distances—100 yards; platoon distances—50 yards; formation—column of twos, 5 yards between men:

$$\begin{aligned}\text{Road space} &= 1,000 + 2.7 + 6 \times \\ &\quad 100 + 20 \times 50 \\ &= 2,700 + 600 + 1,000 \\ &= 4,300 \text{ yards}\end{aligned}$$

- (b) A mixed motor column consisting of—

	Yards
20 trucks, ¼-ton, with weapons in tow at 8 yards each -----	160
25 trucks, ¾-ton, with trailer in tow at 10 yards each -----	250
40 trucks, 2½-ton, with trailers in tow at 16 yards each -----	640
40 tanks at 8 yards each -----	320
125 total	
Total road space at halt -----	1,370
Alternate solution ((2) above): 125 vehicles (mixed) at 10 yards each -----	1,250

c. *Halts (Motor March).*

(1) *Short halts.*

- (a) The observance of routine short halts will be at the discretion of the commander controlling road movement over the route in question.
- (b) Short halts, when specifically ordered, will normally be of 10 minutes' duration and will be made after each 110 minutes running.

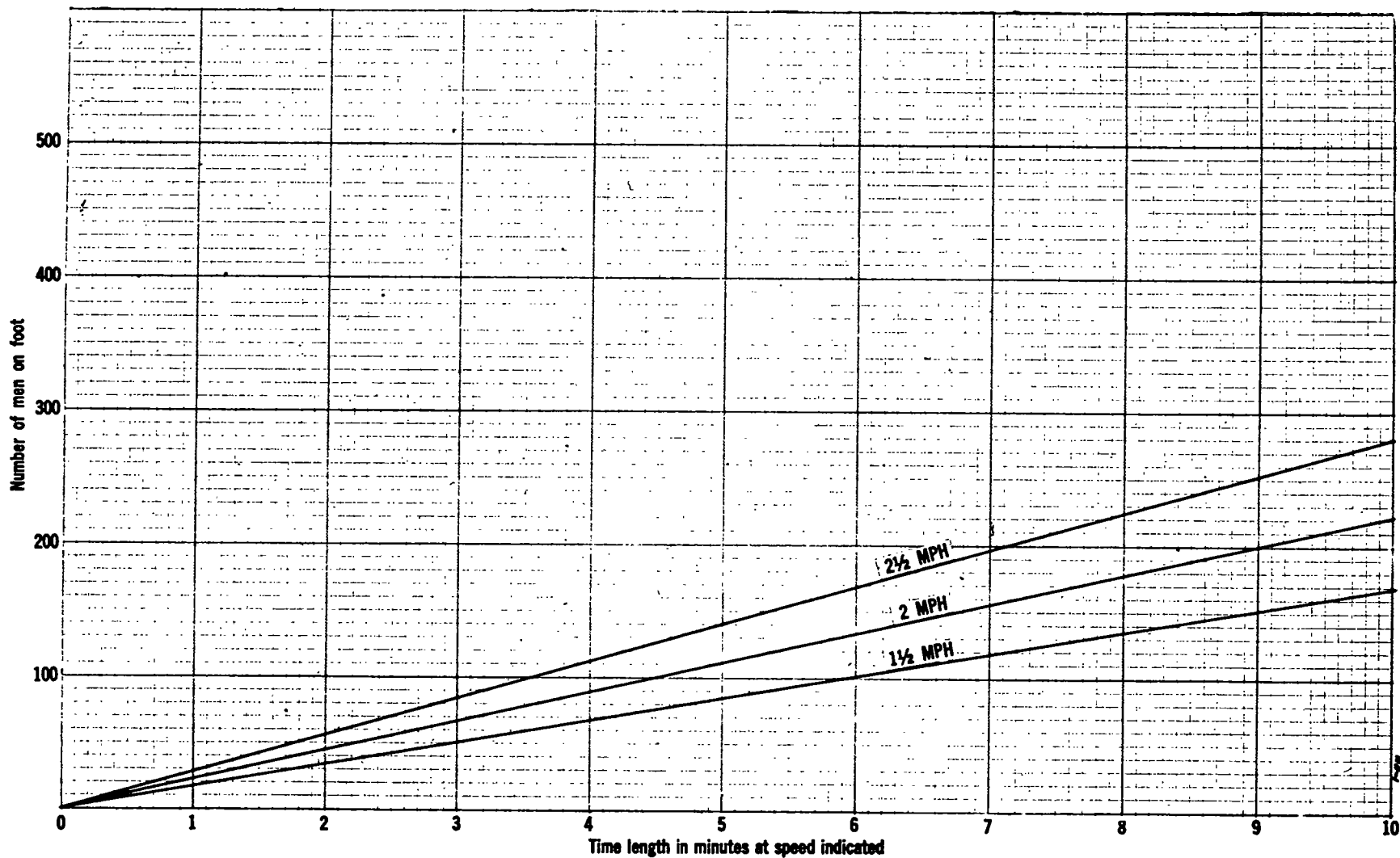
(2) *Long halts.*

- (a) No standard rules for the observance of long halts are laid down, since the existence of cover from the air and the need for refueling are most important factors.
- (b) Long halts must always be specifically ordered and plotted on movement graphs.

² For road spaces and time lengths for motor elements at various rates of march, see paragraph 4.10e.

³ Allows 1 to 2 yards between vehicles. See chapter 5 for actual lengths of vehicles, towed weapons, and trailers.

d. Time Lengths of Columns on Foot—Column of Twos, 5 Yards Per Man. (Does not include unit intervals.)



*e. Rates and Lengths of Road Movements, Foot, and Motor Elements.**

(1) The following rates and lengths of

marches are based upon modern vehicles, trained personnel, and favorable conditions of roads and weather:

	1	2	3	4	5	6	7	
1	Unit	Rates of march (MPH) ¹				Lengths of march on roads (miles per day average) ²	Remarks	
		On roads ³		Cross country				
		Day	Night	Day	Night			
INFANTRY ⁴								
2	Foot troops.....	2½	2	1½	1	12-15 for a division; 15-20 for smaller units.	Length of march increased with well-seasoned troops marching on good roads in favorable weather when required by the tactical situations. ³	
ARTILLERY								
3	Truck-drawn, light or medium.	25	25 (lights) 10 (no lights).	8	5	175		
4	Tractor-drawn, medium (M5).	21	15 (lights) 10 (no lights).	10	4 (lights) (1½ no lights).	150		
5	Truck-drawn, heavy.....	18	18 (lights) 10 (no lights).	6	4	135		
6	Tractor-drawn, heavy.....	15	15 (lights) 10 (no lights).	6	4 (lights) (1½ no lights).	135		
7	Air defense artillery, missile.	20	20 (lights) 10 (no lights).	5	2	175		
8	Air defense artillery, self-propelled.	20	20 (lights) 10 (no lights).	12	5	175		
ARMORED								
9	Tanks, light, and armored carriers.	20	20 (lights) 10 (no lights).	15	5	150		Armored division moves at rate of march of main battle tanks.
10	Tanks, main battle.....	18	15 (lights) 10 (no lights).	10	3	100		
MISCELLANEOUS								
11	Infantry division, motorized.	15	15 (lights) 10 (no lights).	-----	-----	150	Single vehicles or small columns of less than 50 vehicles.	
12	Trucks and ambulances not carrying patients.	25	25 (lights) 10 (no lights).	-----	-----	150		
13	Ambulance carrying patients.	15	10 (lights)	5	5	135		
14	Cars, passenger.....	35	35 (lights) 10 (no lights).	-----	-----	250		

¹ Rate of march is average speed over a period of time, including short, periodic halts

² Rates of march for motorized elements listed in columns 2 and 3 are possible only on improved roads.

³ Greater distances than those given in column 6 may be covered under forced-march conditions.

⁴ For movement over mountainous terrain, an additional allowance of 1 hour should be made for each 1,000 feet of climb.

* The rate of march of a column of elements with different rates of march is regulated by that of the slowest element.

(2) *Road movements in snow and extreme cold.*

- (a) *Foot.* Foot troops marching in snow without snowshoes or skis will have their mobility decreased. The decrease of mobility will depend on several factors, among which are depth and nature of the snow. Normally, snow of a depth of 24 inches or more will prohibit marching unless skis or snowshoes are used. For specially equipped and adequately trained troops, the following rates of march are practicable:

Snowshoes-----1½ to 2½ miles
per hour.

Skis-----1½ to 3½ miles
per hour.

Small bodies of well-trained troops are capable of moving 40 miles a day on skis, under favorable conditions.

- (b) *Motor movement (wheel) in snow.*

Depth snow (in.)	Measures required for movement
3 -----	None.
6 -----	Rear chains.
6-18 -----	Chains all around; and special traction devices on leading vehicles (to break the trail).
18 and over----	Snowplow required.

f. Forced Marches of Foot Elements. For planning purposes, a normal foot march covers 20 miles per day at a rate of 2½ miles per hour. A forced march requires the expenditure of

more than the normal effort in speed, exertion, hours marched, or a combination of these. Although forced marches impair the fighting efficiency of a unit, urgent conditions on the battlefield may require a maximum effort. Full advantage should be taken of those periods when the troops are most rested to increase the rate of march. Rest periods should be scheduled to avoid marching at extremely hot times of the day and to insure the arrival of the unit in effective condition to fight.

g. Vehicle Capacities for Personnel. The capacity of motor transportation for movement of foot troops depends upon the rated capacity of the transportation employed, the type of body on the vehicles, the method of carrying personnel, and the distance personnel are to be moved. Normal capacities for trucks carrying personnel with hand-carried weapons, packs, and extra ammunition, with no additional cargo, are—

	Men
Armored personnel carrier (excluding driver)----	11
Truck, ¼-ton (excluding driver)-----	3
Truck, ¾-ton (excluding driver)-----	9
Truck, 2½-ton (excluding driver)-----	20
Semitrailer, 12-ton (excluding driver)-----	50

Note. When 2½-ton engineer dump trucks carry the loads shown above, some personnel will be required to stand; 12-ton semitrailers should be used to haul troops only in emergencies.

h. Tabulating Number of Trucks Required for Movement by Motor Transport. The following format may be used to tabulate the approximate number of trucks required to move foot elements with individual equipment.

	1	2	3	4	5
1	Unit	Actual strength	Transported in organic motors	Strengths for which transportation must be furnished	Number of 2½-ton trucks required
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

4.9. Basic Terms and Formulas

a. Traffic Flow of Motor Columns. Traffic flow is defined as the total number of vehicles passing a given point in a given time. Traffic flow is expressed in vehicles per hour and can be determined for any route by the following formula:

Traffic flow in vehicles per hour = Density
in vehicles per mile $\times$ speed in miles
per hour $\times F$.

F (a variable) depends upon the standing operating procedure time intervals between march units and serials applicable in the area and on the overall state of proficiency of units operating in the area in motor movement and traffic control. For adaptation to a specific area under field conditions, it is necessary that time and space studies be conducted continuously in order to arrive at a suitable factor. This study may result in a basic factor to which allowance for time interval between march units and serials must be added, or a basic factor including allowance for time interval between march units and serials.

b. Density of Motor Columns.

(1) Density is defined as the number of vehicles per mile of road space occupied by vehicles. Motor columns may be classified as either close column, open column or infiltration.

(a) *Close column.* In close column, vehicles are closed to safe driving distance behind the preceding vehicle. Usually a fixed speedometer multiplier (SM)* is specified (such as 2, 2.35, 2.5, 3, etc.) to accomplish a safe-driving intervehicular distance at all speeds.

(b) *Open column.* In open column, distances between vehicles are increased to accomplish greater dispersion. Usually a fixed distance (such as 100 or 200 yards between vehicles) is specified, but open-col-

* For logistical purposes, SM is any number by which speed in miles per hour is multiplied to determine intervehicular lead in yards.

Example. With an SM of 2, the intervehicular lead of 2 successive vehicles (measured between vehicles) at a speed of 10 MPH is $2 \times 10 = 20$ yards; at a speed of 25 MPH, it is $2 \times 25 = 50$ yards.

umn conditions may be obtained by designating a fixed SM high enough to insure the desired intervehicular lead at the lowest speed expected.

- (c) *Infiltration*. In infiltration, vehicles are dispatched at irregular intervals with a fixed density (such as 3, 4, 5, or 6 vehicles per mile).

- (2) To determine the density of a motor column, when the speed and SM are known, use the following formula:

$$\text{Density} = \frac{1,760 \text{ (yards per mile)}}{\text{Speed (MPH)} \times \text{SM}}$$

Example. With a speed of 20 MPH and an SM of 2, vehicle density equals—

$$\frac{1,760}{20 \times 2} = 44 \text{ vehicles per mile.}$$

c. *Road Space (RS)*.

- (1) Road space is defined as the length, expressed in units, of a column on the road. Road space is the sum of the lengths of the vehicles, the distance between vehicles, and the distance between march elements.
- (2) The road space occupied by a motor column may be obtained when the number of motor vehicles in the column (disregarding trailers and towed weapons), the average density (number of vehicles per mile), and the total of the time intervals between subordinate units are known.

$$\text{Road space (miles)} = \frac{\text{Number of motor vehicles}}{\text{Density (vehicles per mile)}} + \frac{\text{time intervals (min)} \times \text{speed (MPH)}}{60}$$

An approximation of road space may be determined by the following:

$$\begin{aligned} \text{Road space} &= \text{No. of vehicles} \div 75 \text{ (less than 25 vehicles in close column).} \\ &= \text{No. of vehicles} \div 30 \text{ (25 or more vehicles in close column).} \\ &= \text{No. of vehicles} \div 20 \text{ (less than 25 vehicles in open column).} \end{aligned}$$

$$= \text{No. of vehicles} \div 15 \text{ (25 or more vehicles in open column).}$$

$$= \text{No. of vehicles} \div 3 \text{ (any number of vehicles marching by infiltration).}$$

In close column, a 15-minute time interval occupies 2.5 miles of road space and in open column 3.75 miles of road space.

d. *Time Length (TL)*. The time length of a column is the time required for the column to pass a given point. The time length may be determined by the following formula:

$$\text{Time length (min)} = \frac{\text{Road space (miles)} \times 60}{\text{Speed (MPH)}}$$

An approximation of time length may be determined by the following:

$$\begin{aligned} \text{Time length (min)} &= \text{No. of vehicles} \times 0.08 \text{ (less than 25 vehicles in close column).} \\ &= \text{No. of vehicles} \times 0.18 \text{ (25 or more vehicles in close column).} \\ &= \text{No. of vehicles} \times 0.20 \text{ (less than 25 vehicles in open column).} \\ &= \text{No. of vehicles} \times 0.30 \text{ (25 or more vehicles in open column).} \\ &= \text{No. of vehicles} \times 1.33 \text{ (any number of vehicles marching by infiltration).} \end{aligned}$$

e. *Time Distance (TD)*. Time distance is defined as the time required for any one individual or vehicle to travel between two given points. Time distance may be determined by the following formula:

$$\text{Time distance (TD)} = \frac{\text{Distance (D)}}{\text{Rate of march (R)}}$$

f. *Road and Time Interval (RI and TI)*.

- (1) Road interval is defined as the distance between march elements. The road interval between march elements is more significant when the column is moving than when the column is

halted; therefore, it is generally prescribed as a factor of time rather than distance. See (2) below. Road interval may be determined by the following formula:

Road interval

$$(RI) = \frac{\text{Time interval (min)} \times \text{rate (MPH)}}{60}$$

- (2) Time interval may be considered as the conversion of road interval to time. There are no prescribed standard time intervals. These will depend on the size of serials and march units, the time available for the movement, as well as the tactics required for protection against air and nuclear attack. The infantry division, when moving by motor in a tactical march, normally moves in seven serials—one serial for each battle group, one serial for division troops, and one serial for division trains. (See FM 7-100, app III.) The armored division, on the other hand, normally moves in five major march serials—one serial for each combat command, one serial for division troops, and one serial for division trains. Another major difference between the armored and infantry divisions is the normal organization of the divisional march serials. A combat command is organized into march serials of battalion size and march units of company or battery size; whereas, a battle group is organized only into march units of company or battery size. Examples of time inter-

vals are as follows: Between serials (battle groups or combat commands)—15 minutes. Between serials (battalion size)—5 minutes.

$$\text{Between march units} = \frac{\text{vehicles}}{25} \times 2.5 \text{ minutes.}^1$$

4.10. Aids to Planning

a. The detailed work of planning troop movements can be simplified by preparing in advance tables, graphs, and other aids, based on statistical data and experience factors of the unit. The most important of these aids are—

- (1) Tables of simplified formulas for road space and time length.
- (2) Tables of precalculated road space and time length.
- (3) Road space and time length nomographs.
- (4) Unit table of road space and time lengths.
- (5) Tables of time distances.
- (6) Tables of average time factors.
- (7) Road movement graphs.
- (8) Road movement tables.
- (9) Strip map.
- (10) Vehicle availability tables.
- (11) Vehicle assignment tables.
- (12) March calculators.

b. *Example of Tables of Simplified Formulas for Road Spaces and Time Lengths.* This table is based on the infantry division. A time interval of 2½ minutes between company march units (2½ minutes per 25 vehicles) has been allowed for and built into the formulas. Time interval between serials has *not* been included. Similar tables for other units can easily be constructed, keeping in mind the number of time intervals to be built into the formula.

¹ Time interval of 2.5 minutes obtained as follows:
a. Assumed time interval between company-size march units (25 vehicles)—1.5 minutes.
b. Extra time interval for each 25 vehicles—1 minute.

Column formation	Rate (MPH)	Density (veh/mi)	Number of serials	No. of vehicles in serial	Road space (mi)	Time length (min)
Close column.....	10	75	One ¹	25 or less	$0.013V^2$	$0.08V$
				More than 25	$0.03V$	$0.18V$
			Two or more	25 or less	$0.013V/2.5I^3$	$0.08V/15I$
				More than 25	$0.03V/2.5I$	$0.18V/15I$
Open column.....	15	20	One ¹	25 or less	$0.05V$	$0.2V$
				More than 25	0.075	$0.3V$
			Two or more	25 or less	$0.05V/3.75I$	$0.2V/15I$
				More than 25	$0.075V/3.75I$	$0.3V/15I$
Infiltration.....	15	3	NA	Any number	$0.33V$	$1.33V$

¹ Formulas for one serial are applicable to armored division.

² V = number of vehicles.

³ = Number of intervals between serials of battle-group size.

DERIVATION OF SIMPLIFIED FORMULAS

1. Seventy-five vehicles per mile is the density employed when marching in *close column* formation; therefore, each vehicle in a continuous march element occupies a road space of 0.0133 mile. The company-size march unit (averaging 25 vehicles or less) is assumed to be the continuous march element. This vehicular road space, when multiplied by the total number of vehicles (25 or less) in the column, gives the value for the road space of the column.

$$RS = 0.0133V \text{ or } \frac{V}{75} \text{ mi}$$

The road space for one vehicle can be converted to time length, using the equation, $TL = \frac{RS}{R}$, as follows:

$$TL = \frac{0.0133}{10} \times 60 \text{ (to convert to min)} = 0.08 \text{ min}$$

The constant, 0.08, when multiplied by the total number of vehicles (25 or less) in the column, computes the time length of the column.

$$TL = 0.08V \text{ min}$$

2. If a *close column* serial consists of more than 25 vehicles, the time intervals between subordinate march units must be considered in

the calculations. This is done by converting this time interval, $2\frac{1}{2}$ minutes per 25 vehicles, to 0.10 minute per vehicle and adding this value to the constant, 0.08.

$$TL = 0.18V \text{ min}$$

This value of TL can be converted into road space as follows:

$$TL = \frac{RS}{R}$$

$$RS = TL \times R$$

$$RS = 0.18V \times \frac{10}{60} = 0.03V \text{ mi}$$

Also, road space can be calculated using the following method:

$$RS = \left(\frac{V}{75} \right) + \left(\frac{V}{25} \times \frac{2.5}{60} \times 10 \right) = 0.03V \text{ mi}$$

3. Twenty vehicles per mile is the density employed when marching in *open column* formation; therefore, each vehicle occupies a space of 0.05 mile. For a continuous element, then:

$$RS = 0.05V \text{ or } \frac{V}{20} \text{ mi}$$

The road space for one vehicle can be converted to TL as follows:

$$TL = \frac{0.05}{15} \times 60 \text{ (to convert to min)} = 0.2 \text{ min}$$

The constant, 0.2, when multiplied by the total

number of vehicles (25 or less), computes the TL of the column.

$$TL = 0.2V \text{ min}$$

4. If an *open column* serial consists of more than 25 vehicles, the time interval between subordinate march units, 0.10 minute per vehicle, must again be considered. Thus—

$$TL = 0.3V \text{ min}$$

This value of TL can be converted as in 2, above.

5. Whenever a column (*open* or *close*) consists of 2 or more march serials of battle group size, the 15-minute time interval between these serials must be considered in calculations.

Example:

(Veh + intervals between subordinate units) (Intervals between serials)

(Close column)

$$TL = 0.18V + 15I \text{ min}$$

(Close column)

$$RS = 0.18V \times \frac{10}{60} + \left(\frac{15 \times I \times 10}{60} \right) = 0.03V + 2.5I$$

6. Three vehicles per mile is the density employed when marching by *infiltration*; therefore, each vehicle occupies a road space of 0.33 mile. This road space, when multiplied by the total number of vehicles, gives the road space of the column.

$$RS = 0.33V \text{ or } \frac{V}{3} \text{ mi}$$

This road space can be converted to TL as follows:

$$TL = \frac{V}{3} \times \frac{60}{15} = \frac{4V}{3} \text{ min.}$$

c. Example of a Table of Precalculated Road Spaces and Time Lengths. (This example is based on simplified formulas, *b* above.)

Part I—Movement of less than 25 vehicles

Number of vehicles in the column	Roads space (miles)		Time length (minutes)	
	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH
1	0.013	0.05	0.08	0.20
2	0.026	0.10	0.16	0.40
3	0.039	0.15	0.24	0.60
4	0.052	0.20	0.32	0.80
5	0.065	0.25	0.40	1.00

Part I—Movement of less than 25 vehicles—Continued

Number of vehicles in the column	Roads space (miles)		Time length (minutes)	
	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH
6	0.078	0.30	0.48	1.20
7	0.091	0.35	0.56	1.40
8	0.104	0.40	0.64	1.60
9	0.117	0.45	0.72	1.80
10	0.130	0.50	0.80	2.00
20	0.260	1.00	1.60	4.00

Part II—Movement of 25 or more vehicles

Number of vehicles in the column	Roads space (miles)		Time length (minutes)	
	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH	Close column 75 veh/mi— 10 MPH	Open column 20 veh/mi— 15 MPH
1	0.03	0.075	0.18	0.3
2	0.06	0.150	0.36	0.6
3	0.09	0.225	0.54	0.9
4	0.12	0.300	0.72	1.2
5	0.15	0.375	0.90	1.5
6	0.18	0.450	1.08	1.8
7	0.21	0.525	1.26	2.1
8	0.24	0.600	1.44	2.4
9	0.27	0.675	1.62	2.7
10	0.30	0.750	1.80	3.0
20	0.60	1.500	3.60	3.3
30	0.90	2.250	5.40	9.0
40	1.20	3.000	7.20	12.0
50	1.50	3.750	9.00	15.0
60	1.80	4.500	10.80	18.0
70	2.10	5.250	12.60	21.0
80	2.40	6.000	14.40	24.0
90	2.70	6.750	16.20	27.0
100	3.00	7.500	18.00	30.0
200	6.00	15.000	36.00	60.0
300	9.00	22.500	54.00	90.0
400	12.00	30.000	72.00	120.0
500	15.00	37.500	90.00	150.0

Illustrations of use.

PROBLEM. Determine the time length of 2 infantry battle groups (minus), each motorized (175 vehicles each) and moving in the same serial in close column formation.

ANSWER. Add the following values from the above table:

$$TL \text{ for } 300 \text{ vehicles} = 54.00 \text{ minutes}$$

$$TL \text{ for } 50 \text{ vehicles} = 9.00 \text{ minutes}$$

TI = 15.00 minutes (Time interval between serials of battle group assumed to be 15 minutes for purposes of this example.)

TL = 78.00 minutes for 350 vehicles.

Note. 2½-minute time intervals between company-size march units have been allotted for and built into the values in the table.

d. Road Space and Time Length Nomograph.

(1) The following nomograph shows average road spaces and time lengths under ideal conditions and does *not* include allowance for time intervals between march units. Actual road space and time length may vary somewhat, depending on conditions.

(2) To determine road space—

- (a) Determine the number of motor vehicles in column, disregarding trailers or towed weapons.
- (b) Locate the figure on vertical scale at left of chart, marked "Number of vehicles."
- (c) Locate the figure showing average density under which the movement

will be made on the vertical scale marked "Density (veh/mi)."

- (d) Connect these two points with a straightedge. Read the figure at the point of intersection of the straightedge with the vertical scale marked "Road space (miles)."
 - (e) This will be the road space, in miles, occupied by the column under the given conditions.
- (3) To determine time lengths—
- (a) Obtain road space as instructed in (2) above.
 - (b) Locate the figure representing the speed in miles per hour on the vertical scale marked "Speed (MPH)."
 - (c) Connect these two points with a straightedge.
 - (d) Read the figure at the intersection of the straightedge with the vertical scale marked "Time length."
 - (e) This figure is the time length of the column under the conditions given.

e. Example of Format for a Unit's Table of Road Spaces and Time Lengths.* This format has been prepared for the infantry division. By use of appropriate TOE and the basic formulas contained in b above, completed tables can be prepared for any unit.

LINE 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Unit	Actual strength							Road space (miles)				Time length (minutes)					Additional veh to carry foot trp (coln 9) (2½-ton trk) ¹	Total veh in march coln when unit moves by trk (coln 8 + coln 18)	Road space (miles)		Time length (minutes)	
		Off and EM	Or- ganic veh	Veh not in march colm				Veh in march colm	Men on foot	Men on foot halted or moving Colm of twos	Veh in march Colm (coln 8)		Men on foot			Veh in march Colm (coln 8)				Veh of units mtz (coln 19)		Veh of units mtz (coln 19)	
				Recon party	Dis- persed along route	Veh adv party	Veh in field trans				Close colm 75 veh/ mi 10 MPH	Open colm 20 veh/ mi 15 MPH	Close colm 75 veh/ mi 15 MPH	Open Colm 20 veh/ mi 15 MPH	Colm of twos		Close colm 75 veh/ mi 10 MPH			Open Colm 20 veh/ mi 15 MPH	Close colm 75 veh/ mi 10 MPH	Open colm 20 veh/ mi 15 MPH	
															1½ MPH	2 MPH							2½ MPH
2	Inf div (1)																						
3	HQ & HQ co, inf div																						
4	Inf BG (ea) (5)																						
5	HQ & HQ co																						
6	Rifle co (ea) (5)																						
7	Cmbt spt co																						
8	Div arty																						
9	HQ & HQ btry																						
10	FA how bn, 105-mm and 155-mm, towed, (ea) (3)																						
11	HQ & HQ btry																						
12	FA how btry, 105-mm, towed																						
13	FA how btry, 155-mm, towed																						
14	FA how bn, 105-mm and 155-mm, SP (ea) (2)																						
15	HQ & HQ btry																						
16	FA how btry, 105-mm, SP																						
17	FA how btry, 155-mm, SP																						
18	FA bn, 762-mm rkt, SP, 8-in. how, towed																						
19	HQ & HQ btry																						
20	FA how btry, 8 in, towed																						
21	FA msl btry, 762-mm rkt, SP																						
22	Armor bn, 90-mm																						
23	HQ & HQ co																						
24	Med tx co (ea) (5)																						
25	Cav sq																						
26	HQ & HQ trp																						
27	Armd cav trp (ea) (3)																						
28	Avn co																						
29	Trans acft maint det																						
30	Engr bn																						
31	HQ & HQ co																						
32	Engr co (ea) (5)																						
33	Sig bn																						
34	HQ & HQ co																						
35	Comd op co																						
36	Plat W main CP																						
37	Plat W adv CP																						
38	Plat W bde HQ																						
39	Plat W tn HQ																						
40	Plat W rear ech CP																						
41	Fwd comm co																						
42	Plat W ea BG																						
43	Div tn ²																						
44	HQ & HQ det and band																						
45	Admin co																						
46	QM co																						
47	Ord bn																						
48	HQ & main spt co																						
49	Fwd spt co																						
50	Med bn																						
51	HQ & HQ det																						
52	Clr co																						
53	Amb co																						
54	Trans bn																						
55	HQ & HQ co																						
56	Trk transport co																						
57	Armd carr co (ea) (2)																						
58	Inf BG tac grouping ² (ea) (5)																						
59	Div trp ²																						

¹ Based on 20 men per 2½-ton truck with trailer.
² For composition of typical inf BG tac groupings, div trp, and div tn, see FM 7-100, app III.
GENERAL. Use data in d above as a guide in completing form.
Columns 2, 3, and 9: Based on periodic reports of subordinate units.
Column 6: Group which normally precedes main body to new area for reception of troops.
Column 7: Vehicles not required for immediate support, such as kitchen, baggage, motor maintenance, are designated field trains.
Column 10: Number of men on foot (col 9)² × 1.2 or 2.7 (par. 4.8b(1)) × unit intervals = yards.
Columns 11 and 12; 20 and 21: Numbers of vehicles × factor (par. 4.9c) + time intervals in miles = miles.
Columns 13, 14, and 15: $\frac{\text{Road space (coln 10)} \times 60}{\text{Speed (MPH)}} = \text{time length (minutes)}$.

*Based on TOE _____, dated _____.

Columns 16, 17, 22, and 23: Number of vehicle × factor (par. 4.9d) + time intervals in minutes = time length (minutes).
Column 18: Number of men on foot (coln) ÷ 20, except to insure tactical integrity.
³ In computing men on foot, first consideratin is given to the basic loads of the vehicles. After this basic load is placed on vehicles, the remaining capacity loaded with personnel.
⁴ Time intervals within a serial average 2½ minutes per 25 vehicles (not considered when serial consists of less than 50 vehicles). Time intervals between serials is 5 minutes.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
1	Type of emplacement or shelter	Protection afforded ¹							Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools ⁴					Weight and volume of materials									
		Nuclear weapons effects ²				Conventional weapons effects ³								Revetment materials for cover support only						Complete revetment			
		Nuclear radiation transmission factors			Fortification protection factor	Thermal effects	Tracked vehicles	Artillery fragments	Revetment materials for cover support only		Complete revetment		No revetment materials used	Corrugated metal construction ⁶		Sized lumber construction		Corrugated metal construction ⁶		Sized lumber construction			
		Initial gamma	Initial neutron	Residual gamma ⁵					Corru- gated metal const	Sized lumber const	Corru- gated metal const	Sized lumber const		Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)		

CHARACTERISTICS OF CREW-SERVED WEAPONS EMPLACEMENTS

2	Open automatic rifle emplacement.....	0.1	0.3	0.1	65	Very good	Good	Fair	NA	NA	7.0	8.0	4.0	NA	NA	NA	NA	170	3.0	200	6.0
3	Automatic rifle emplacement with 18" of cover.	0.07	0.2	0.02	55	Very good	Virtually none	Good	4.0	5.0	6.0	7.0	NA	45	0.5	70	2.0	220	4.0	270	10.0
4	Open horseshoe-type machinegun emplacement.	0.15	0.4	0.1	70	Good	Fair	Fair to good	NA	NA	5.0	7.0	2.0	NA	NA	NA	NA	280	5.0	450	14.0
5	Open two 1-man foxhole-type light machinegun emplacement.	0.1	0.3	0.1	65	Very good	Good	Good	NA	NA	6.0	7.0	4.0	NA	NA	NA	NA	530	10.0	640	20.0
6	Horseshoe-type light machinegun emplacement with full cover.	0.06	0.2	0.003	55	Very good	Fair	Very good	9.0	11.0	11.0	14.0	NA	190	4.0	250	7.0	720	13.0	890	27.0
7	Two 1-man foxhole-type light machinegun-type emplacement with ½ cover and adjoining shelter.	0.015	0.03	0.0005	30	Excellent	Good	Excellent	15.0	22.0	19.0	28.0	NA	250	2.5	630	20.0	520	7.5	850	30.0
8	Circular-type .50 cal machinegun emplacement.	0.3	0.5	0.15	80	Fair	Fair	Fair	NA	NA	14.5	16.5	10.0	NA	NA	NA	NA	300	5.0	420	13.0
9	Pit-type emplacement for 3.5-inch rocket launcher.	0.3	0.5	0.15	80	Fair	Fair	Fair	NA	NA	5.0	6.0	3.0	NA	NA	NA	NA	110	1.0	160	5.0
10	81-mm mortar emplacement.....	0.4	0.7	0.3	85	Good	Virtually none	Fair	NA	NA	12.0	NA	NA	NA	NA	NA	NA	210	3.0	NA	NA
11	4.2-inch mortar emplacement.....	0.4	0.7	0.3	85	Good	Virtually none	Fair	NA	NA	29.0	NA	NA	NA	NA	NA	NA	370	6.0	NA	NA
12	Recoilless rifle position (mounted)....	0.4	0.6	0.2	80	Fair	Virtually none	Fair	NA	NA	NA	NA	30.0	NA	NA	NA	NA	NA	NA	NA	NA
13	Recoilless rifle position (dismounted)...	0.5	0.7	0.2	85	Fair	Virtually none	Fair	NA	NA	NA	NA	17.0	NA	NA	NA	NA	NA	NA	NA	NA

CHARACTERISTICS OF ARTILLERY WEAPONS EMPLACEMENTS

14	105-mm howitzer emplacement.....	0.6	0.8	0.6	90	Good	Virtually none	Fair	NA	NA	NA	NA	100.0	NA	NA	NA	NA	NA	NA	NA	NA
15	155-mm howitzer emplacement.....	0.6	0.8	0.6	90	Good	Virtually none	Fair	NA	NA	NA	NA	170.0	NA	NA	NA	NA	NA	NA	NA	NA

¹ Protection afforded assumes the occupants of fortifications are in the most protected position of their fortifications. For most fortifications, protection decreases as the angle of sight from the position to the center of the weapon burst increases.
² For blast effects, see FM 5-15, paragraph 16.
³ a. For direct fire weapons effects, see FM 5-15, paragraph 9.
b. For close combat weapons effects, see FM 5-15, paragraph 7.
⁴ Assumes normal digging capability in daylight with trained troops.
⁵ Assumes fallout is kept out of hole at surface level by some sort of cover.
⁶ May include wooden framing and braces.

Note. Classification of Fortifications by Attenuating of Residual Radiation.

a. Fortifications may be generally classified according to their attenuation of residual radiation. Such classification is shown below:

Fallout Attenuation Classifications

Transmission factors	Classification	General guidance in high-level radiation field
Less than 0.001.....	Excellent.....	Remain in place.
0.001 to 0.005.....	Good.....	Probably remain in place.
0.005 to 0.01.....	Fair.....	Probably leave position at optimum time.
More than 0.01.....	Poor.....	Leave position at optimum time.

b. A general idea of the dose to be expected with the classification shown above is tabulated below, using a fallout arrival time of H + 1 and a stay time of 96 hours. Under these conditions, the total incident dose in rad is exactly three times the dose rate of H + 1. Assuming an H + 1 dose of 5,000 rad/hour:

Interior Dose for Various Fallout Classifications*

Classification	Total dose
Excellent.....	Less than 15 rad*
Good.....	15 to 75 rad*
Fair.....	75 to 150 rad*
Poor.....	More than 150 rad*

* See conditions in FM 5-15, appendix II, on fortification protection factor.

(2) Characteristics of crew-served infantry and artillery weapons emplacements.

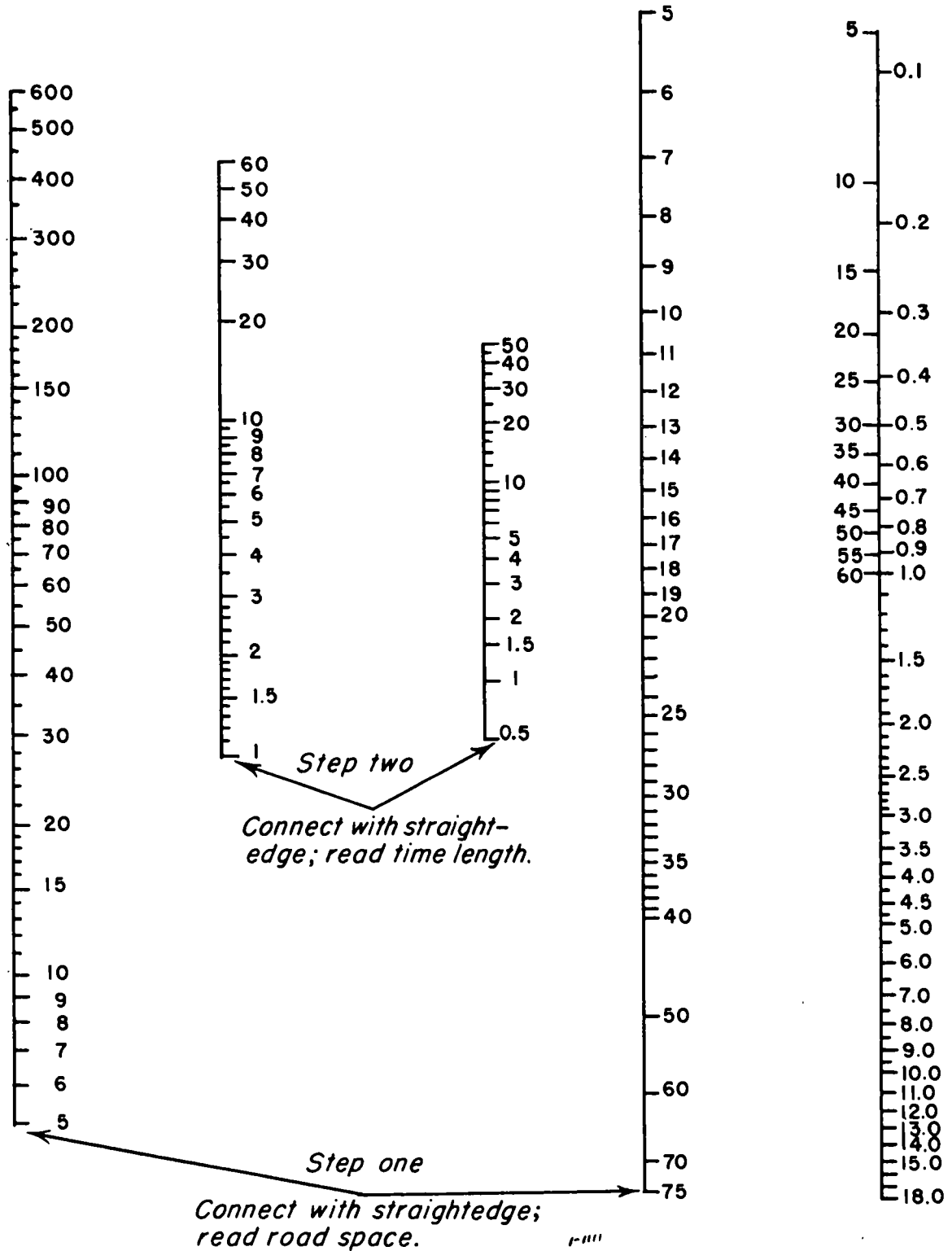
Number
of
vehicles

Road
space
(miles)

Speed
(MPH)

Density
(veh/mi)

Time
length
(minutes) (hours)



f. *Example of a Table of Time Distances.* Precomputed tables of time distances for routine rates of march will simplify calculations. An example of such a table, based on 15 MPH, is as follows:

Distance traveled 	0	1	2	3	4	5	6	* 7 	8	9
0	0	4	8	12	16	20	24	28	32	36
10	40	44	48	52	56	60	64	68	72	76
20	80	84	88	92	96	100	104	108	112	116
30	120	124	128	132	136	140	144	148	152	156
40	160	164	168	172	176	180	184	188	192	196
50	200	204	208	212	216	220	224	228	232	236
60	240	244	248	252	256	260	264	268	272	276
70	280	284	288	292	296	300	304	308	312	316
80	320	324	328	332	336	340	344	348	352	356
90	360	364	368	372	376	380	384	388	392	396
100	400	404	408	412	416	420	424	428	432	436
110	440	444	448	452	456	460	464	468	472	476
120	480	484	488	492	496	500	504	508	512	516
130	520	524	528	532	536	540	544	548	552	556
140	560	564	568	572	576	580	584	588	592	596
150	600	604	608	612	616	620	624	628	632	636
** 160	640	644	648	652	656	660	664	**668	672	676
170	680	684	688	692	696	700	704	708	712	716
180	720	724	728	732	736	740	744	748	752	756
190	760	764	768	772	776	780	784	788	792	796
200	800	804	808	812	816	820	824	828	832	836
210	840	844	848	852	856	860	864	868	872	876
220	880	884	888	892	896	900	904	908	912	916
230	920	924	928	932	936	940	944	948	952	956
240	960	964	968	972	976	980	984	988	992	996
250	1,000	1,004	1,008	1,012	1,016	1,020	1,024	1,028	1,032	1,036
260	1,040	1,044	1,048	1,052	1,056	1,060	1,064	1,068	1,072	1,076
270	1,080	1,084	1,088	1,092	1,096	1,100	1,104	1,108	1,112	1,116
280	1,120	1,124	1,128	1,132	1,136	1,140	1,144	1,148	1,152	1,156
290	1,160	1,164	1,168	1,172	1,176	1,180	1,184	1,188	1,192	1,196
300	1,200	1,204	1,208	1,212	1,216	1,220	1,224	1,228	1,232	1,236

** Illustrations of use.

PROBLEM. What is the time distance of a vehicle moving between points A and B, which are 167 miles apart, at a rate of 15 MPH?

ANSWER. Enter left-hand column at 160, move across to the vertical line under 7, and read the time distances of 668 minutes directly from the table.

g. Average Time Factors—Infantry Division.

- (1) These data pertain to G3 time factors considered after an infantry division receives a movement order. They give the times required by the command for—

- (a) Making preparations before the leading vehicle can arrive at the start point.
- (b) Completing the motor march and making preparations to launch a coordinated attack.

- (2) The preparations before the leading vehicle can arrive at the start point include transmission of orders by division; assembling trucks; spotting trucks; map reconnaissance of routes, detrucking areas, and assembly areas; issue of extra ammunition; briefing of troops; and other normal preparations for an anticipated movement. This preparation pertains to the *first* trip, whether the division is completely motorized by the attached transportation and moves in one trip or whether the division moves by organic transportation in two or more trips (echelon). The earliest time in which the leading vehicle can pass the start point after receipt of the order by the division commander is—

Hours

- (a) If the order was received in daylight for a daylight march (for example, received at 1000), leading vehicle can cross the start point at 1130--- 1½
- (b) If the order was received at night for a night march (for example, received at 2200), leading vehicle can cross the start point at 2400--- 2

- (c) If the order was received in daylight for a night march (for example, received at 1100), leading vehicle can cross the start point 1 hour after EENT ----- 1 hour after EENT

(For EENT, see par. 3.18f.)

- (d) If the order was received at night for a daylight march, and more than 2 hours prior to BMNT (for example, received at 0200), leading vehicle can cross the start point at BMNT. BMNT
- (For BMNT, see par. 3.18f.)

(If the order was received less than 2 hours prior to BMNT, the time is the time the order was received plus 2 hours.)

Note. To determine corresponding time factors for a foot march rather than a motor march, use ½ hour less in (a), (b), and (c) above.

- (3) The factors considered in computing time for an infantry division to complete a march and to make preparations for launching a coordinated attack are dependent on whether the march is made by echelon or completed in one trip. The time factors in (a), (b), (c), and (d) below are applicable only when the march is made by echelon. The time factors shown in (e), (f), (g), (h), and (i) below apply to any motor move and outline the procedure used in determining the earliest time at which an infantry division can launch a coordinated attack. These factors are based on the assumption that the infantry division can launch

a coordinated attack when each of the battle groups participating in the coordinated attack is in position behind the line of departure. Since the closing of these battle groups requires more time than the preparation and movement of the other forces, supporting units, such as artillery, reserves, etc., will be in position prior to closing of the battle groups on the line of departure. The factors are further based on the assumption that these assault forces will be the leading elements of the road movement serials.

	Day	Night
(a) Dump basic loads__	15 min	30 min
(b) Load basic loads__	30 min	60 min
(c) Reassemble trucks for each trip made in convoy.	20 min	40 min
(d) Entruck personnel_	10 min	20 min
(e) Complete the motor march from the old area to the new area.	See above.	

Note. If the release point (RP) is 3 miles or less from the detrucking point (DP), time distance will be the time to complete the move from the start point to RP. Any consideration of time consumed in moving by motor from the RP to the DP in the new area is included in the time factors given in (g) below. If the distance is over 3 miles from RP to DP, the time to traverse this distance must be added to the time required to complete the move from the start point to the RP before considering the time factor for detrucking troops in (f) below.

	Day	Night
(f) Detruck, reform foot troops _____	5 min	10 min
(g) Organization and movement in the new assembly area prior to troops reaching the foot start points for the foot march to the line of departure.		

(This includes movement from the RP as outlined in (e) above as well as time to issue any additional rations or ammunition carried in each truck transporting troops.) _____ 30 min 60 min

(h) Time to move from foot start points in the new area to line of departure (time distance of foot march.) _____ See paragraph 4.8e(1)

(i) Time for final preparation after the leading man reaches the line of departure and prior to launching a coordinated attack. (This factor includes time to close foot troops behind the line of departure, time to reconnoiter, issue orders in subordinate units, and emplace and register infantry weapons where necessary.) _____ 60 min 90 min

h. Average Time Factors—Armored Division.

- (1) These data pertain to G3 time factors considered after an armored division receives a movement order. They give the times required by the command for—
 - (a) Making preparations before the leading vehicle can arrive at the start point.
 - (b) Completing the motor march and making preparations to launch a coordinated attack.

- (2) The preparations before the leading vehicle can arrive at the start point are less time consuming than in the infantry division since the armored division is able to move the entire division by organic vehicles. Preparations include transmission of orders by division, briefing of troops, and other normal preparations for an anticipated move. It is SOP for armored division vehicles to be refueled and expended ammunition replaced at once whenever a halt is made or any element of the division enters an assembly area, thus permitting vehicles to move as soon as personnel and equipment are loaded.

Hours

- (a) If the order was received in daylight for a daylight march (for example, received at 1000), leading vehicle can cross the start point at 1045 ----- $\frac{3}{4}$
- (b) If the order was received at night for a night march (for example, received at 2200), leading vehicle can cross the start point at 2300 ----- 1
- (c) If the order was received in daylight for a night march (for example, received at 1100), leading vehicle can cross the start point 30 minutes after EENT ----- 30 minutes
(For EENT, see par. after EENT 3.18f.)
- (d) If the order was received at night for a daylight march, and more than 1 hour prior to BMNT (for

example, received at 0200), leading vehicle can cross start point at BMNT ----- BMNT
(See par. 3.18f(1).)
(If order was received less than 1 hour prior to BMNT, the time is the time the order was received plus 1 hour.)

- (3) The factors considered in computing time for an armored division to complete a march and to make preparations for launching a coordinated attack are dependent upon whether the armored division is organized for combat. Generally, it is assumed, unless otherwise stated, that the division is organized for combat in anticipation of the move and commitment to battle. The time factors in (b) and (c) below apply to any move and are based on the assumption that the armored division can launch a coordinated attack when two reinforced battalions (equivalent of one infantry battalion and one tank battalion) of each combat command are in position to attack. If the division formation is a column of combat commands, only the time factors for the leading combat command are computed. If the division formation is combat commands abreast, the time factors for the combat command with the greatest distance to traverse are computed as the factors for the entire division. If an armored division is not organized for combat, time must be allowed (as included in (a) below) to permit battalions and supporting units to assemble under a combat command and organize into reinforced battalions under the combat command commander. Other commands, such as the combat command in reserve, division troops, division artillery, division trains, and units placed in division troops, can be assumed to complete

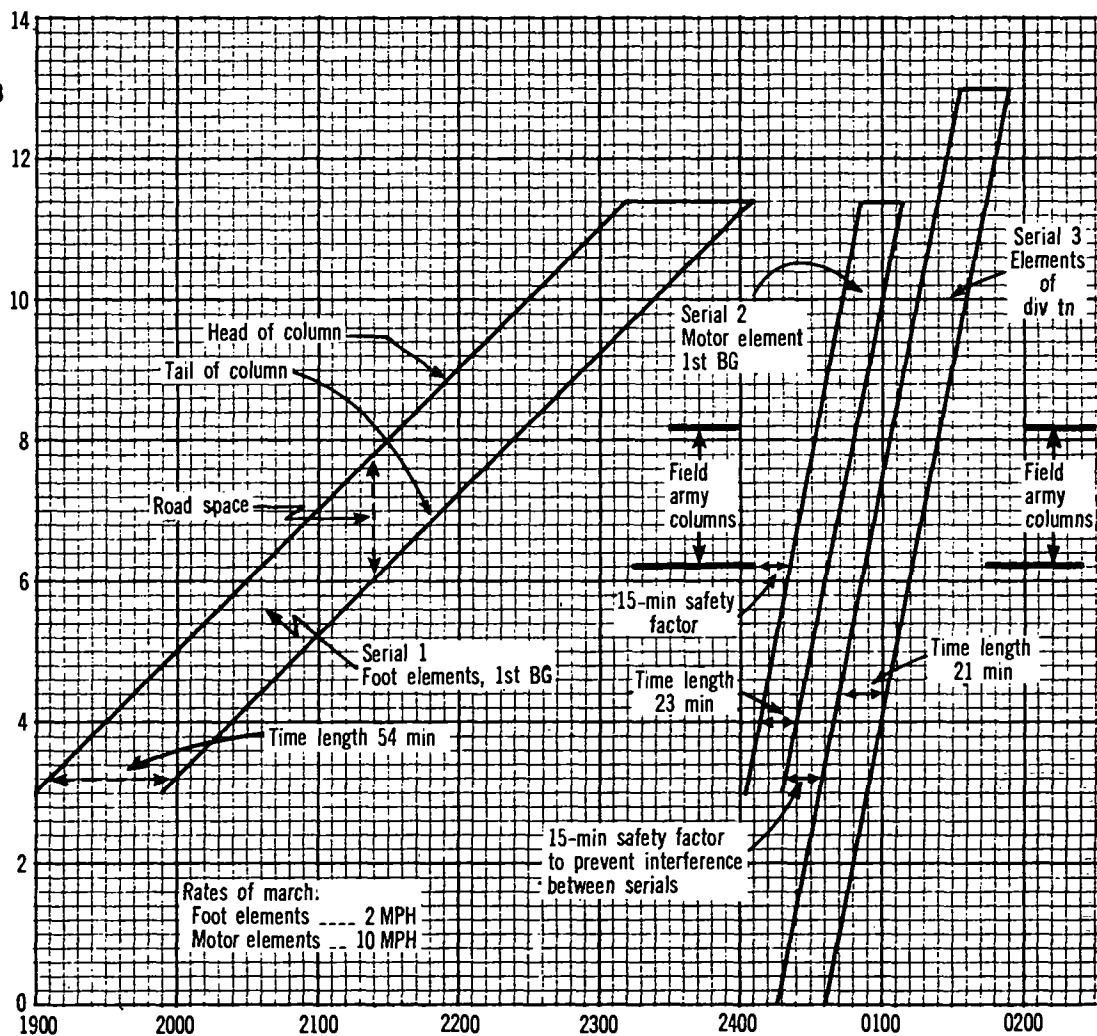
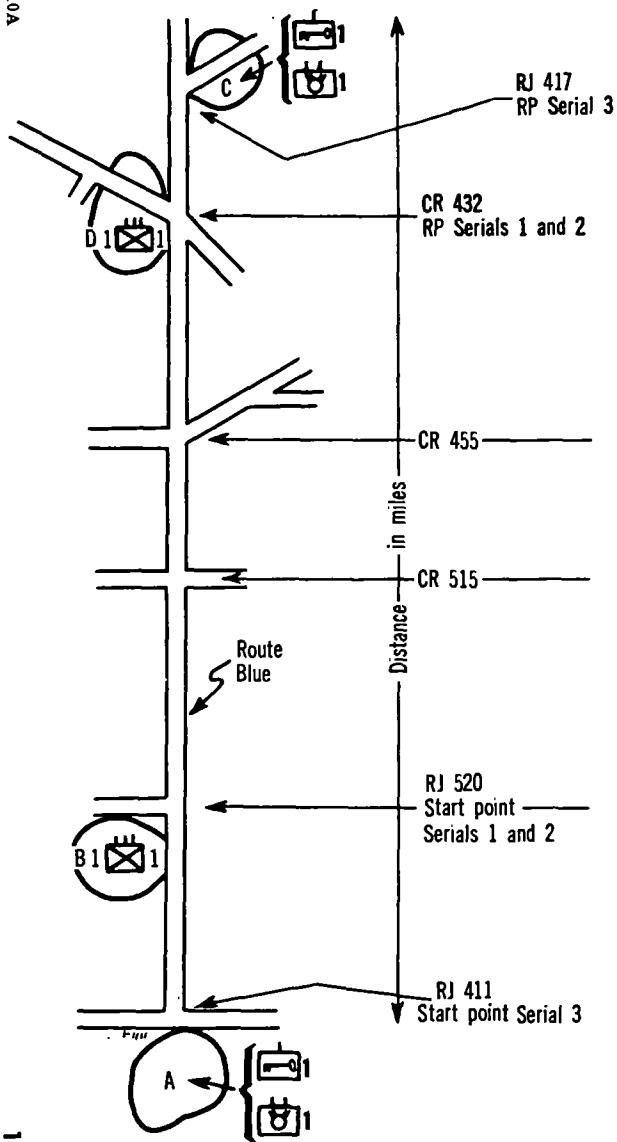
their organization in less time than a combat command and therefore are not included as a factor. The organization of combat commands and reinforced battalions may be partially or entirely completed either in bivouac, assembly area or attack position, or a combination thereof. The time factor, however, remains the same.

- | | <i>Day</i> | <i>Night</i> |
|--|----------------|--------------|
| (a) Organize combat commands and reinforced battalions. (In either one or combination of bivouac, assembly area and attack position) ----- | 45 min | 1 hr 30 min |
| (b) Complete march from old area to new area ----- | See (3) above. | |
| (c) Time for final reconnaissance, refueling, and preparations to cross the line of departure or leave attack position (may be a combined assembly area-attack position) ----- | 30 min | 1 hr |

i. Road Movement Graphs.

- (1) A road movement graph is the simplest method of obtaining data required for a road movement table or order. It shows the approximate location at any hour of the head or tail of each serial, providing the road movement proceeds as scheduled. The vertical scale to the left, with point of origin at the bottom, serves as a distance scale in miles and should show the relative locations, along the route, of critical points where coordination of the movement is required. The horizontal scale provides a time scale in hours, beginning at the left with the earliest hour at which the first serial may start the march.
- (2) A serial is represented graphically by drawing a line to represent the movement of the head of the serial and a line to represent the movement of the tail of the serial. The lines are parallel and are drawn with a slope that represents the rate of march. (At 10 miles per hour, the slope equals 10 miles on the vertical to 1 hour on the horizontal scale.)
- (3) *Example of road movement graph.*
 - (a) The 1st Infantry Division commander has directed that elements of the 1st Ordnance Battalion, 1st Quartermaster Company, and of the 1st Battle Group (minus Company E), 1st Infantry, move under cover of darkness from their present bivouacs, areas A and B, to areas C and D. Foot troops and motor vehicles will move during the night 27-28 October. Movement is to begin 271900 October and is to be completed 280430 October.

(b) Road movement graph.



j. Road Movement Table.

- (1) *General.* A road movement table is normally published as an annex to the march or operation order. The road movement table contains information and instructions concerning the march serials involved in the movement, their serial numbers, rates of march, routes, start points, times of crossing the start points, release points, critical points, times of arrival at or departure from critical points, and other pertinent details. This information is usually obtained from an accurate knowledge of the status of routes and units and from a road movement graph (*i* above). If desired, some of the information contained in the road movement table may be determined by march calculations. The road movement table usually consists of two parts: a data paragraph reflecting general information, or information common to two or more serials; and a tabular list of the march serials, to-

gether with all other necessary information regarding them. Road movement tables will frequently require a wider distribution than a march or operation order so that copies can be issued to movement control personnel, military police traffic posts, and the like.

- (2) *Example of road movement table.* (See fold-in facing this page.)

k. Strip Map.

- (1) *General.* A strip map is a schematic sketch of the routes of march that contain useful information concerning them. A strip map should be included as an annex to the march order issued by the division, combat command, or battle group. It is particularly useful to small-unit commanders for organizational control. Strip maps should be reproduced in quantity by using units and supplied to key personnel, particularly to vehicle commanders and route markers.

(2) Example of road movement table.

Annex_____ (Road Movement Table) to OPORD_____

Reference: Map***.

1. Average or maximum speed.

2. Traffic density (type march column).

3. Halts.

4. Routes between start points (SP) and release points (RP).¹

(Classification)

5. Critical points.¹
(a) Start points.
(b) Release points.
(c) Other critical points.

Normal ORORD heading

6. Main routes to start points.¹

7. Main routes from release point.¹

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Serial	Date ²	Organization and commander	No. of vehicles	Load class of heaviest vehicles	Present location ³	Route ¹	New location ³	Route to start point	TL (min)	Control of movement			Route from release point	Remarks
										Location of critical points ⁴	Arrival time	Clearance time		
1	(***)	1/61 Inf (Reinf), Col Johns, 61st Inf, Comdr	(***)	(***)	SAARBURG area	RED	METZ area	(***)	75	SP RJ (THIONVILLE) METZ RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)
2	(***)	2/62 Inf (—), Col Smith 62d Inf, Comdr	(***)	(***)	SAARBURG area	RED	METZ area	(***)	45	SP RJ (THIONVILLE) METZ RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)
3	(***)	3/63 Inf (Reinf), Col Dunn, 63d Inf, Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	95	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	1730 1746 1810 1922 1954	1905 1921 1945 2057 2129	(***)	(***)
4	(***)	Div Trp, Col Short, Div Arty, Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	154	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	1920 1936 2000 2112 2144	2150 2206 2220 2342 0014	(***)	(***)
5	(***)	Div Tn, Lt Col Evans, 20th Ord Bn, Comdr	(***)	(***)	SAARBURG area	BLUE	METZ area	(***)	65	SP BIBICHE Bridge RJ (BOUZONVILLE) RP DP	2205 2229 2305 0053 0117	2310 2334 0010 0158 0222	(***)	(***)
6	(***)	4/64 Inf (Reinf), Col Henry 64th Inf, Comdr	(***)	(***)	SAARBURG area	YELLOW	METZ area	(***)	75	SP RJ (SAARLAUTERN) RJ (ST AVOLD) RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)
7	(***)	5/65 Inf (—), Col Pickett, 65th Inf, Comdr	(***)	(***)	SAARBURG area	YELLOW	METZ area	(***)	45	SP RJ (SAARLAUTERN) RJ (ST AVOLD) RP DP	(***) (***) (***) (***)	(***) (***) (***) (***)	(***)	(***)

Acknowledge⁵

Appendixes

Distribution

Authentication

Commander⁵

(Classification)

¹ Routes and points are described in the data paragraphs by grid references, code, words, etc., and, if necessary, numbered or lettered for ease of reference in the columns below.

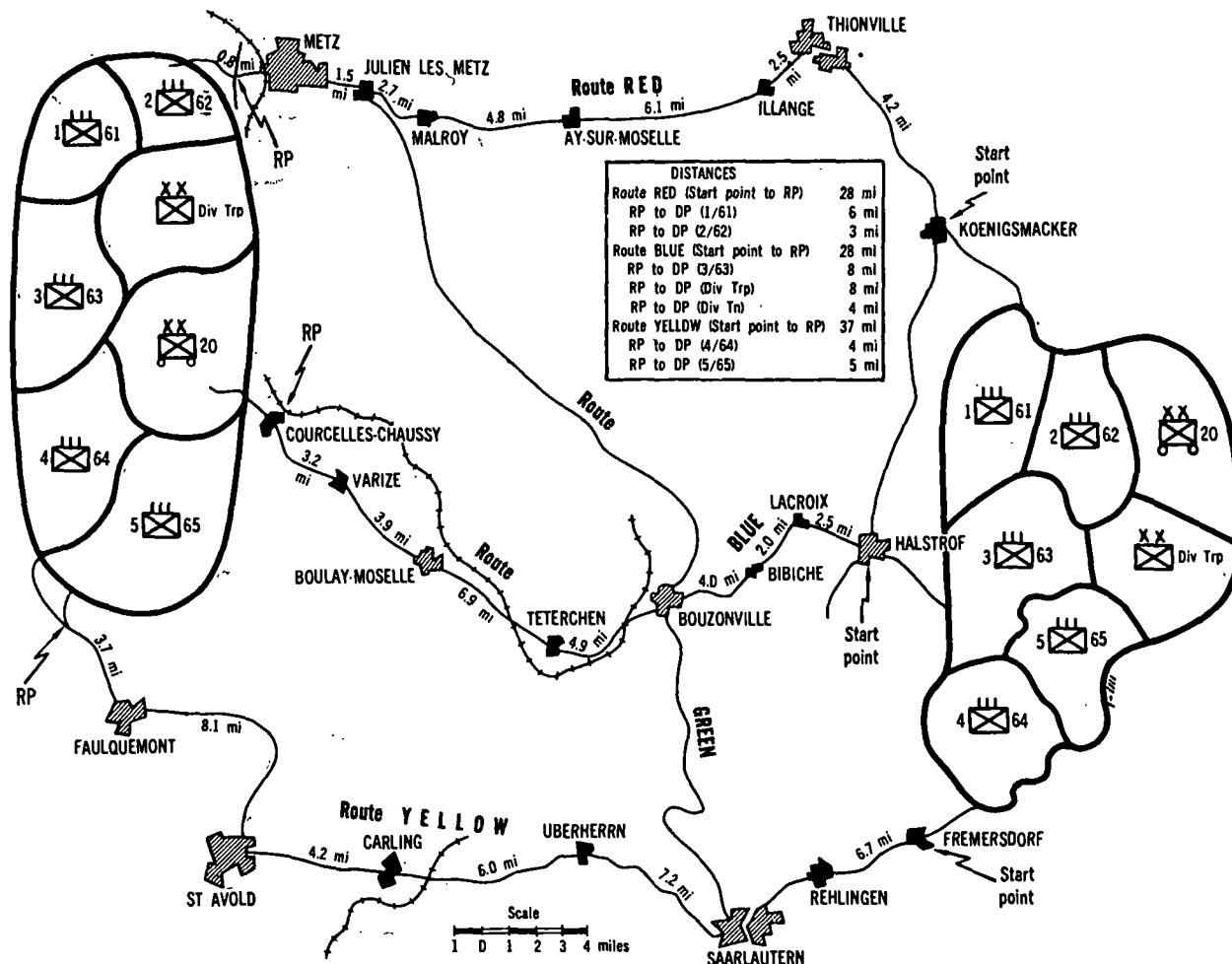
² Only the minimum number of columns of the table should be used.

³ Since the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or locations.

⁴ Critical point is defined as a selected point along a route used for reference in giving instructions. It includes start points, release points, and other points along a route where interference with movements may occur.

⁵ If the table is issued by itself, and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.

(2). Example of strip map.



I. Vehicle Availability-Table.

(1) *General.* The vehicle availability table is used in planning the movement of an infantry division by means of its own organic transportation. It helps the transportation officer make a plan for drawing 2½-ton or 5-ton trucks from subordinate units of the division in accordance with their ability to furnish them. Across the top of the table are listed all the subordinate units of the division except the cavalry squadron. This unit is omitted because its vehicles are not normally available. In column 1, the 2½-ton and 5-ton trucks of the division are divided into priorities of availability according to

their normal uses. When the transportation officer levies on units for trucks, he will deplete each priority, starting with the highest, until he obtains the required number of vehicles. All the 2½-ton and 5-ton trucks of the division do not appear on the table. The prime movers, maintenance vehicles, command and fire control vehicles, and essential signal communication vehicles are omitted because it is not intended that these vehicles ever be used for general cargo hauling or for transporting troops of other units. For any given move, the number of vehicles actually available will vary because of deadlined trucks, combat losses, and

restrictions applicable to the move under consideration. Using the vehicle availability table and the troop strengths of the units requiring additional transportation, the number and source of vehicles required for the march can be quickly and accurately determined.

m. Vehicle Assignment Table.

(1) *General.* The assignment table shows from which units the vehicles will be drawn and to which units they will be assigned for the move. This table is based on the vehicle availability table (1(2) above).

(2) *Example of vehicle assignment table.*

	1	2	3	4	5	6	7
		Number of 2½-ton or 5-ton trucks provided and unit to which furnished					
		1st echelon ¹			2d echelon		
	Unit from which transport is furnished	1/61	3/63	4/64	2/62	5/65	Elm div trp and div tn ²
2	1st BG, 61st Inf.....					22	
3	3d BG, 63d Inf.....				22		
4	4th BG, 64th Inf.....				22		
5	2d BG, 62d Inf.....		5				
6	5th BG, 65th Inf.....	5					
7	HQ Btry, 20th Inf Div Arty.....				1	3	
8	1st Rkt How Bn (HJ/8-in.), 46th Arty.....					20	
9	20th Engr Bn.....		5				
10	20th Sig Bn.....	2					
11	20th QM Co.....	5					
12	20th Ord Bn.....		5				
13	20th Trans Bn.....	30	30	(3)			
14	20th Admin Co.....	3					
15	Total.....	45	45	0	45	45	

¹ The division troops that move with the first echelon are completely mobile. The administrative equipment of these troops that cannot be transported on organic transportation will be moved by transportation battalion trucks with elements of division troops in the second echelon.

² The 2½-ton trucks in the transportation battalion will be used to assist the movement of all units in division troops and division trains that are not 100 percent mobile.

³ The two armored carrier companies will be attached to 4th BG, 64th Inf. for movement of personnel and equipment for which no organic transportation has been provided. Based on 75 percent vehicle availability, 2 armored carrier companies normally have 80 armored carriers operational at any given time.

n. March Calculator.

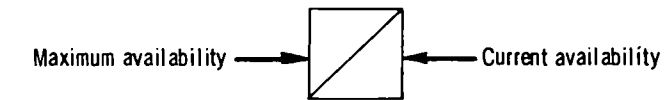
(1) *General.* A march calculator is a special form of a slide rule. The desired road space or time length of any unit can be read directly from the calculator, providing the number of vehicles in the unit column is known. The calculator readings include the road space or time interval between march units but not those between march serials of battalion, battle group, or combat command size. When using the calculator to determine road

space or time length of two or more infantry battle groups, add to readings a 15-minute time interval (or equivalent road space) for every interval between march serials of battle group size. When using the calculator to determine road space or time length of two or more combat commands, add to readings the following time intervals (or equivalent road spaces):

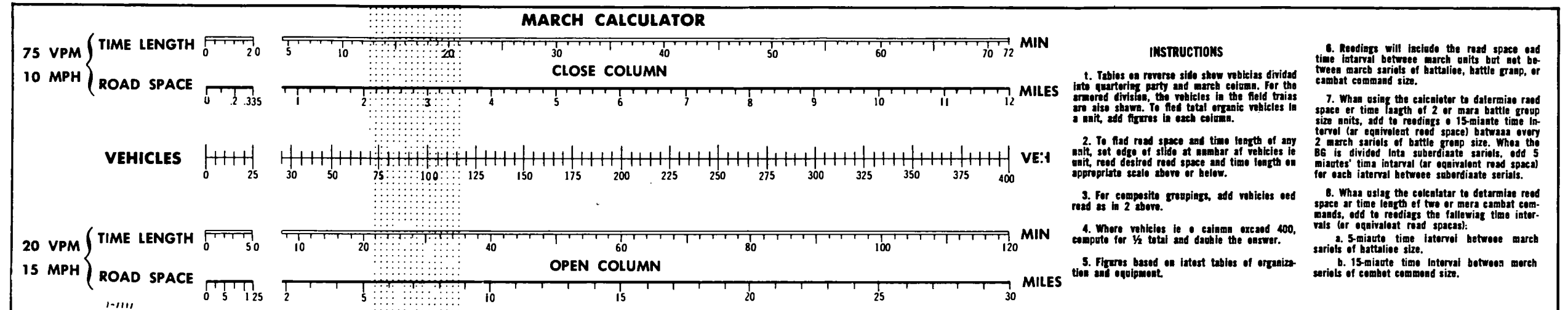
- (a) 5-minute time interval between march serials of battalion size.
- (b) 15-minute time interval between

(2) Example of vehicle availability table.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Priority	Normal use	1st BG, 61st Inf	2d BG, 62d Inf	3d BG, 63d Inf	4th BG, 64th Inf	5th BG, 65th Inf	HQ & HQ Btry, 20th Inf Div Arty	1st How Bn (105-mm/155-mm), 45th Arty	2d How Bn (105-mm/155-mm), 45th Arty	3d How Bn (105-mm/155-mm), 45th Arty	4th How Bn (105-mm/155-mm), (SP), 45th Arty	5th How Bn (105-mm/155-mm), (SP), 45th Arty	1st Rkt How Bn (HJ/8-in), 46th Arty	20th Engr Bn	1st Med Tk Bn (Patton), 1st Armor	HQ Co, 20th Inf Div	20th QM Co	20th Med Bn	20th Ord Bn	20th Sig Bn ¹	20th Trans Bn ²	20th Admin Co	20th Avn Co	20th Trans Det (Aft Maint)	HQ & HQ Det, 20th Inf Div Tn and Band	Total div
		Max																								Max
		Aval																								Aval
1	Sup and gen cgo	3	3	3	3	3	3	3	3	3	3	3	4	5	15	0	0	0	6	6	80	0	0	2	0	151
2	Org eqp	0	0	0	0	0	7	9	9	9	9	9	8	10	7	1	7	6	15	9	10	3	9	0	1	138
3	Ki trk	7	7	7	7	7	1	3	3	3	3	3	3	6	6	1	1	1	1	3	1	2	1	0	1	78
4	Engr tool and brg	4	4	4	4	4	0	0	0	0	0	0	0	57	0	0	0	0	0	0	0	0	0	0	0	77
5	Ammo trk	11	11	11	11	11	0	10	10	10	10	10	0	0	9	0	0	0	0	0	0	0	0	0	0	114
6	Sig comm	0	0	0	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4
	Total	25	25	25	25	25	14	25	25	25	25	25	15	79	37	2	8	7	22	18	91	5	10	2	2	562

¹ Sig bn veh shown are those which do not have shifters or sig eqp installed thereon.² The trans bn includes in addition 2 armd carr co, consisting of 114 carr, pers, full-tracked, armd (M113) type, that are not shown on the table. Based on 75 percent veh avsilability, these co can transport 935 pers.

(2) Example of march calculator.

FM 101-10
PART I
4.10**BASIC INFANTRY UNITS**

ORGANIC VEHICLES INFANTRY DIVISION (FULL STRENGTH)		Quartering party	March column
HQ & HQ co, Inf div	8	45	
Bde HQ		6	
BG (5 ea)	12	160	
HQ & HQ co	4	71	
Cmbt spt co	3	49	
Rifle co (5 ea)	1	8	
Inf div arty	19	528	
HQ & HQ btry	1	54	
FA how bn (towed) (3 ea)	3	77	
FA how bn (SP) (2 ea)	3	80	
FA rkt/how bn	3	83	
Engr bn	6	154	
HQ & HQ co	1	74	
Engr co (5 ea)	1	16	
Med bn	2	58	
HQ & HQ det	1	9	
Amb co		40	
Clr co	1	9	
Drd bn	2	99	
HQ & maint spt co	1	44	
Fwd spt co	1	55	
DS sec (6 ea)		6	
QM co	1	56	
Sig bn	3	174	
HQ & HQ co	1	42	
Comd op co	1	71	
Fwd comm co	1	61	
BG area spt plat (5 ea)		12	
Trans bn	4	227	
HQ & HQ co	1	23	
Armd carr co (2 ea)	1	60	
Trk transport co	1	84	
Trans acft maint det	1	8	
Avn co	1	58	
Cmbt spt sec of DS plat (5 ea)		5	
Admin co	1	11	
HQ & HQ det, inf div tn & band	1	9	
Armor bn (90-mm)	6	200	
HQ & HQ co	1	80	
Med tk co (5 ea)	1	24	
Cav sq	4	153	
HQ & HQ trp	1	45	
Armd cav trp (3 ea)	1	36	
Trk required to motorize 1 BG		37	
Armd carr required to mec2 dismtd elms 1 BG		67	
Additional trk required to motorize 1 BG when 1 armd carr co is atch to or in spt of BG		7	
Additional trk required to motorize inf div assuming 100 percent availability of organic transportation		79	

BASIC ARMORED UNITS

ORGANIC VEHICLES ARMORED DIVISION (MARCHING VEHICLES)		Quartering party	Field trains	March column
Armor bn (90-mm) (4 ea)	14	26	164	
Med tk co (4 ea)		(1)	(24)	
Inf bn (4 ea)	14	18	149	
Rifle co (4 ea)		(1)	(23)	
FA how bn (105-mm) (SP) (3 ea)	6	12	114	
FA how btry (105-mm) (SP) (3 ea)	(1)	(1)	(20)	
FA rkt/how bn	6	12	131	
FA how btry (155-mm) (SP) (2 ea)	(1)	(1)	(21)	
FA how btry (8-in) (SP)	(1)	(1)	(20)	
FA msl btry (HJ) (SP)	(1)	(1)	(26)	
ADA AW bn (SP)	2	16	128	
AW btry (4 ea)	(1)	(2)	(25)	
Engr bn	6	(263)		
Engr co (4 ea)	(1)	(1)	(29)	
Engr btry co	(1)	(1)	(70)	
Engr brg plat (3 ea)		(10)		
Aslt brg plat		(11)		
Armd veh launched brg sec (3 ea)		(3)		
Cav sq	5	13	203	
Armd cav trp (4 ea)	(1)	(1)	(35)	
MP co * 44	5		3	
MP plat * 11 (4 ea)				
Sig bn *	28	* 17	119	
Comd op co	(14)	(* 17)	(35)	
Rr ech op plat *	(1)		(4)	
Tns area op plat *	(4)		(8)	
Fwd comm co	(13)	(34)		
CC area spt plat (3 ea)	(4)		(8)	
HQ & HQ co, armd div	7		41	
HQ & HQ co, CC (3 ea)	6	1	29	
HQ & HQ btry, div arty	6		47	
HQ & HQ det, armd div tn & band	2	10		
Trans acft maint det		9		
QM bn	2	167		
Ord bn		2	165	
HQ & main spt co		(2)	(60)	
Fwd spt co			(35)	
Med bn		2	95	
Clr co			(25)	
Clr plat (4 ea)			(5)	
Amb co			(54)	
Amb plat (4 ea)			(13)	
Admin co *		1	13	
Avn co		1	61	
Cmbt spt sec (4 ea)			(1)	
Arty spt sec			(3)	

* Not organic to armd div.

* Dispersed along route.

* Aprx 80 percent mobile.

* Rr ech op plat and tns area op plat loc with admin co and div tns.

* Aprx 10 percent mobile depending on nr of replacements.

march serials of combat command size.

4.11. Motor Movement by Echelon

a. Definition. Motor movement by echelon is a movement in which a unit, such as an infantry division, lacking sufficient organic transportation to move all its personnel and equipment in one trip, uses a portion of its transportation to move its foot troops and essential supplies (by complete tactical units) in successive trips until the movement of all has been completed.

b. Sequence. The sequence of events can be briefly shown in terms of time consumed as follows:

- (1) Preparation time (first echelon).
- (2) Time distance (each route).
- (3) Time length (close entire first echelon).
- (4) Unload.
- (5) Reassembly.
- (6) Time distance (each route).
- (7) Time length (returning trucks).
- (8) Load.
- (9) Reassembly (head of column at start point).
- (10) Time distance (each route).
- (11) Time length (close entire second echelon).

c. Basic Principles. Although vehicles must be utilized to the maximum in a movement by echelon, there are certain basic principles to be observed if the combat efficiency of the division is to be maintained. These are as follows:

- (1) In levying on units for transportation, exclude weapons vehicles, prime movers, maintenance trucks, and essential command, reconnaissance, and signal communication vehicles. Units must retain their battlefield mobility and effectiveness.
- (2) Leave sufficient ammunition vehicles with units moved in the first echelon to enable them to conduct operations until supply can be instituted. It is preferable that these units have the use of all their ammunition vehicles. However, they are normally allowed

to retain at least two-thirds of them.

- (3) Normally provide for the field trains to march with their parent organizations. Field trains consist of kitchen, baggage, and administrative vehicles and such fuel, medical, and maintenance vehicles that are not part of the combat trains. Upon arrival in the new area, field train vehicles in the first echelon, assigned for movement of the second echelon, dump their basic loads and return to assist in the movement of that echelon.
- (4) Avoid dumping the basic loads of a large number of vehicles in the forward area.
- (5) Employ as a group vehicles taken from a unit wherever possible in order to facilitate control and maintenance by the parent unit.
- (6) Employ vehicles from other elements of a unit to move the foot troops of that unit whenever possible. Similarly, vehicles from units usually associated in a normal combat grouping should be used to move the foot troops of that grouping.
- (7) Use only 2½-ton or 5-ton trucks, including dump trucks, unless otherwise prescribed, to move foot troops.

d. SOP. Since motor movement by echelon requires careful planning, it is advisable for a division to have several plans prepared in the form of an SOP. Time for planning such moves will nearly always be short. In such a situation, to modify an existing plan is much quicker than to prepare an entirely new one. SOP plans should contain—

- (1) A plan number.
- (2) A standard composition for the division security force.
- (3) A standard composition and duties of quartering (advance) party.
- (4) The units to move in each echelon.
- (5) Organization of columns.
- (6) The assignment of vehicles to move foot troops and impedimenta, showing the unit from which obtained and the unit to which assigned for the move.

- (7) Adequate provisions for signposting and traffic control.

e. Time Formula. When time precludes detailed planning, such as outlined above, the following formula may be useful in rapidly estimating the total time of such a movement:

Hours required =

$$\frac{\text{Number of trips} \times \text{distance in miles}}{\text{Rate of march in miles per hour}} + T$$

- (1) The "number of trips" is the number of trips in either direction; for example, in a two-echelon movement, three trips would be required—one forward trip to move foot troops, a return trip, and a second trip forward for the remainder of troops and organic loads.
- (2) T (a variable) represents the number of hours consumed in unloading and loading personnel and equipment, in turnarounds at forward and rear assembly areas and in closing the column into its area of destination. When two routes are available and the movement is made in close column in two echelons, a value of six may be assumed for T, as giving a reasonable factor of safety. When more than two routes are available, the value of T may be reduced.
- (3) "Rate of march in miles per hour" represents the average speed of the vehicles in the movement over a period of time, including short halts.

4.12. Movement by Air

a. General.

- (1) The tables in this paragraph may be used as a general guide to determine the aircraft requirements, by type of transport aircraft, for air movement of nondivisional units that might be found in a type field army (par., 4.2). For aircraft requirements for air movement of the airborne or infantry division and organic units thereof, see FM 57-100 or FM 7-100, respectively. For data to compute aircraft require-

ments to transport Army aircraft in Air Force transport aircraft, see paragraph 7.44e. The following tables are based on data compiled for a theoretical situation which assumes full TOE strength and complete TOE equipment. In applying these tables to actual air movements, bear in mind that the required lift for any unit will fluctuate with the personnel and equipment status of that unit and with the allowable cargo load of the aircraft for the specific operational conditions of the air movement. The tables show numbers of aircraft loads; i.e., the number of sorties, by type of aircraft, required to move a particular unit. Fewer aircraft than shown may be used to transport the unit if part or all of the aircraft fly more than one sortie.

- (2) The air movement of a large body of troops normally will involve departures from several airfields and, in air-landed operations, concurrent landing at several terminal airfields, air-landing facilities, or landing zones in the objective area. The availability of transport aircraft, air installations, and base facilities; the urgency of the situation; and enemy capabilities will be major factors which will determine the number of installations employed as well as the number of sorties to be flown by the transporting aircraft. For general considerations and procedures governing the employment of air transportation, see FM 100-5, 101-5, 57-30, and 57-100. For specific information regarding load planning, determination of aircraft requirements, and forms relative to air movement, see TM 57-210.

b. Aircraft Requirements—Field Army.

- (1) *General.* The tabulated data in (4) below represent aircraft requirements for selected units of a type field army. These data are provided as a guide only in planning for airborne oper-

ations or the administrative air movement of units of a type field army.

- (2) *Equipment and supplies.* Column 3 of these tables indicates the total weight of each unit in short tons. This figure is the sum of the weights of TOE personnel, TOE equipment, and required supplies.

- (a) *TOE personnel and equipment.* Unless otherwise indicated, all units are moved at 100 percent personnel and equipment TOE strength. An average weight of 240 pounds per individual is used in determining total personnel weight for a unit. Weights of vehicles are determined by use of net weights as given in TM 9-2800-1, or other applicable technical manuals.

- (b) *Supplies.* The major classes of supply considered are classes I, III, and V. The accompanying class II and IV supplies will be limited to critical items and usually will be in such small amounts that their weights are incidental; for this reason, they are not included in these computations.

1. Class I supply is based on 3 days to accompany each unit, with an average of 6.6 pounds per man per day.
2. Class III supply is based on the weight of gasoline, oil, and lubricants required to operate vehicles a minimum of 300 miles. Class III requirements for other self-propelled equipment and for fuel-consuming machinery are established on a reasonable hourly operational basis for 3 days.
3. Class V supply weights are based on the basic load for all units adjusted to a reasonable rate of expenditure to reflect 3 days of class V supply.

- (3) *Aircraft requirements.*

- (a) Aircraft requirements listed in (4)

below reflect the number of sorties required to transport the various units.

- (b) Aircraft requirements are based on the following assumed allowable cargo loads (1,000-nautical-mile range):

Type aircraft	Allowable cargo load (lb)
C-123, medium assault transport airplane -----	11,785
C-119, medium transport airplane -----	13,630
C-130, medium transport airplane -----	29,500
C-124, heavy transport airplane -----	40,500

- (c) Aircraft requirements utilizing C-123's are not indicated. However, as a rough approximation, C-123's may be substituted for C-119's on a one-for-one basis.

- (d) In determining aircraft requirements, the "type load method" (as opposed to the "weight method" (see TM 57-210)) has been utilized. Units have been loaded administratively rather than tactically.

- (e) Air Force troop carrier units providing aircraft for the specific operation being considered will announce to the Army component of the airborne force the allowable cargo load for each type of aircraft to be employed; the allowable cargo load will vary with the distance to be flown and other operational conditions.

- (f) In any airborne operation, it may be necessary to use types of aircraft other than those listed. However, the data given will serve as a basis for adaptation of the units to be moved to the types of aircraft that are available.

- (g) Three types of combinations of aircraft are indicated in column 4.

1. Combination 1 consists of C-119's and C-124's. In determining aircraft requirements for this

combination, the minimum required number of C-124's has been utilized; i.e., items of equipment which cannot be carried in C-119's have been loaded in C-124's; after filling type loads for the C-124's, the remainder of the unit's personnel, equipment, and supplies have been loaded into C-119's.

2. Combination 2 consists of C-130's and C-124's. In determining aircraft requirements for this combination, C-124 loads remain the same as in combination 1; personnel, equipment, and supplies of the C-119 loads have been reloaded into C-130's.
3. Combination 3 is for C-124's only. In determining aircraft requirements for this combination, all personnel, equipment, and supplies have been loaded into C-124's.
4. Units noted as "not transportable in medium transport aircraft" have such quantities of heavy or bulky equipment that efficient loading utilizing combination 1 is precluded.
5. Units noted as "not air-transport-

able" are those whose primary mission depends on items of equipment which cannot be loaded into C-124's.

- (h) In selecting aircraft or combinations of aircraft by which to transport a unit, careful consideration must be given to the primary mission of the unit and the requirement for the unit in the objective area. During the initial stages of an airborne assault, units transported to the objective area will utilize a combination of parachute and assault aircraft. Subsequent to the initial assault and after landing facilities have been prepared, medium transport aircraft may be used in the air-landed role. When facilities are developed sufficiently to handle heavy transport aircraft, units requiring this means of transportation can be brought into the objective area.
- (i) For supplemental classified data on airlift requirements for field artillery units with nuclear capabilities, air defense units, and nuclear weapon and missile support units, see FM 101-10, part III, chapter 4, section III.

(4) *Tabulated requirements—a type field army.*
(a) *Divisions.*

1	1		2	3	4	5			7	8	
	Unit		TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements				Remarks	
						C-119 ¹	C-130	C-124			
2	Armd div.....		17D	-----	-----	-----	-----	-----	-----	(2)	
3	Inf div.....		7D	-----	-----	-----	-----	-----	-----	See FM 7-100.	
4	Abn div.....		57D	-----	-----	-----	-----	-----	-----	See FM 57-100	

¹ As a rough approximation, C-123's may be substituted for C-119's on a one-for-one basis. (See (3)(b) and (c), p. 143.)

² Not air-transportable. (See (3)(g) & above.)

(b) *Nondivisional units.*

1	2	3	4	5	6	7	8
Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
				C-119 ¹	C-130	C-124	
2 Armored							Armored units of the field army not air-transportable.
<i>Army aviation:</i>							
3 HQ & HQ det, avn gp	1-102P	(2)	1	7			(3)
			2		5		
			3			3	
4 Army avn co	1-137D	217.1	1	23		3	(3)
			2		14	3	
			3			12	
5 Corps avn co	1-127D	219.2	1	23		3	(3)
			2		13	3	
			3			11	
6 Corps arty avn co	1-117D	(2)	1	29		2	(3)
			2		18	2	
			3			12	
7 Avn fxd-wing lt transport co	1-107T	183.7	1	24		1	(3)
			2		12	1	
			3			10	
8 Army avn op det	1-207D	81.2	1	6		2	
			2		4	2	
			3			4	
<i>Air defense artillery:</i>							
9 HQ & HQ btry, ADA bde	44-101C	193.0	1	26		1	
			2		17	1	
			3			10	
10 HQ & HQ btry, ADA gp	44-12C	175.0	1	26		1	
			2		17	1	
			3			9	
11 ADA AW bn, SP	44-85D	1,780.0	1	57		69	Tank recovery vehicle, medium not air-transportable.
			2		40	69	
			3			89	
12 ADA gun bn, SKY-SWEEPER	44-35D	1,566.0	1	106		43	
			2		65	43	
			3			78	
13 ADA msl bn, NIKE-HERCULES	44-535T	2,815.0	43			145	
14 ADA msl bn, HAWK (mb)	44-235T	2,423.0	43			125	
15 ADA op det	44-7R	65.0	1	10			
			2		7		
			3			4	
16 ADA op det, MSL MONITOR	44-57T	(2)	43			7	
<i>Field artillery:</i>							
17 HQ & HQ btry, army arty	6-601 (Tent)						Data not available.

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Field artillery—Continued:</i>							
18	HQ & HQ btry, corps arty	6-501D	221.0	1	38			
				2		22		
				3			12	
19	HQ & HQ btry, abn corps arty	6-501D	215.0	1	39			
				2		22		
				3			12	
20	HQ & HQ btry, FA gp	6-401D	134.0	1	20			
				2		10		
				3			8	
21	FA how bn, 105-mm, SP	6-315D						(⁵)
22	FA how bn, 155-mm, towed	6-135C	1,286.0	1	75		31	
				2		48	31	
				3			57	
23	FA how bn, 155-mm, towed	6-135C	1,096.8	1	119		6	2½-ton cargo trucks substituted for light cargo tractors.
				2		76	6	
				3			51	
24	FA how bn, 155-mm, SP	6-325C						(⁵)
25	FA how bn, 8-in., towed	6-415D	1,336.0	1	57		46	Bulldozers not air-transportable.
				2		38	46	
				3			66	
26	FA how bn, 8-in., SP	6-415D						(⁵)
27	FA msl bn, CORPORAL	6-545E	966.0	43			49	
28	FA msl bn, HONEST JOHN rkt, SP	6-525D	746.0	1	35		22	
				2		25	22	
				3			33	
29	FA msl bn, LACROSSE, SP	6-585T						(⁶)
30	FA gun bn, 280-mm	6-535C						(⁵)
31	FA obsn bn	6-575C	951.0	1	132		10	
				2		88	10	
				3			52	
32	FA slt btry	6-558D	293.0	3			15	Cannot be loaded into medium aircraft without major disassembly of searchlight, carbon arc.
								(⁵)
33	FA msl gp, REDSTONE	6-630T						
	<i>Chemical:</i>							
34	HQ & HQ det, cml gp	3-32D	40.0	1	6			
				2		3		
				3			2	
35	HQ & HQ det, cml smoke genr bn	3-266D	24.0	1	4			
				2		2		
				3			2	
36	Cml smoke genr co	3-267D	316.0	1	47			
				2		22		
				3			16	
37	HQ & HQ det, cml bn, svc	3-36D	18.0	1	3			
				2		2		
				3			1	

See footnotes at end of table

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Chemical—Continued:</i>							
38	Cml maint co.....	3-47D	108.0	1	8		3	
				2		6	3	
				3			6	
39	Cml dep co.....	3-67D	147.0	1	10		4	
				2		6	4	
				3			8	
40	Cml co, cmbt spt.....	3-71D	375.0	1	55			
				2		30		
				3			19	
41	Cml decon co.....	3-217D	156.0	1	26			
				2		17		
				3			9	
42	Cml sup team (EA).....	3-500D	16.0	1	3			
				2		2		
				3			1	
43	Cml sup team (EB).....	3-500D	26.0	1	1		1	
				2		1	1	
				3			2	
44	Cml sup team (EC).....	3-500D	27.0	1	1		1	
				2		1	1	
				3			2	
45	Cml sup team (ED).....	3-500D	43.0	1	4		1	
				2		3	1	
				3			3	
46	Cml maint team (FA).....	3-500D	26.0	1	1		1	
				2		1	1	
				3			2	
47	Cml maint team (FB).....	3-500D	30.0	1	2		1	
				2		1	1	
				3			2	
48	Cml maint team (FC).....	3-500D	41.0	1	3		1	
				2		2	1	
				3			2	
49	Cml maint team (FD).....	3-500D	51.0	1	5		1	
				2		3	1	
				3			3	
50	Cml tech intel det (IA).....	3-500D	10.0	1	2			
				2		1		
				3			1	
51	Cml tech intel det (IB).....	3-500D	14.0	1	3			
				2		2		
				3			1	
52	Cml mbl lab det (JA).....	3-500D	17.0	1	3			
				2		2		
				3			1	
53	Cml RADC det (LA).....	3-500D	4.1	1	1			
				2		1		
				3			1	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
54	<i>Engineer:</i> HQ & HQ co, engr bde.....	5-301R	100.3	1 2 3	16 ----- -----	----- 10 -----	----- ----- 5	(3)
55	HQ & HQ co, engr cmbt gp.....	5-192C	119.8	1 2 3	19 ----- -----	----- 11 -----	----- ----- 7	
56	HQ & HQ co, abn engr cmbt gp....	5-192C	(2)	1 2 3	19 ----- -----	----- 11 -----	----- ----- 7	
57	HQ & HQ co, engr cmbt bn, army....	5-36D	322.5	1 2 3	29 ----- -----	----- 16 -----	9 9 18	(3)
58	Engr cmbt co, army.....	5-37D	245.3	1 2 3	25 ----- -----	----- 17 -----	4 4 13	
59	HQ & HQ co, engr const gp.....	5-312R	66.0	1 2 3	10 ----- -----	----- 5 -----	----- ----- 4	
60	HQ, H&S co, engr const bn.....	5-316R	844.8	1 2 3	28 ----- -----	----- 16 -----	39 39 43	Crushing and screening plant must be disassembled.
61	Engr const co.....	5-317R	317.0	1 2 3	12 ----- -----	----- 8 -----	12 12 16	
62	HQ & HQ co, engr maint and sup gp..	5-262R	77.0	1 2 3	12 ----- -----	----- 7 -----	----- ----- 4	
63	HQ & HQ det, engr cam bn.....	5-96D	33.5	1 2 3	5 ----- -----	----- 3 -----	----- ----- 2	
64	Engr cam co.....	5-97D	59.8	1 2 3	10 ----- -----	----- 7 -----	----- ----- 3	
65	HQ & HQ co, engr topo bn, army....	5-56D	156.0	1 2 3	20 ----- -----	----- 14 -----	1 1 8	
66	Engr map repro and distr co, army..	5-57D	196.8	1 2 3	14 ----- -----	----- 9 -----	5 5 11	
67	Engr photomapping co, army.....	5-59D	108.5	1 2 3	7 ----- -----	----- 4 -----	3 3 6	
68	Engr topo co, corps.....	5-167C	226.0	1 2 3	16 ----- -----	----- 11 -----	6 6 12	
69	HQ & HQ det, engr dep bn.....	5-266D	39.5	1 2 3	6 ----- -----	----- 4 -----	----- ----- 2	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Engineer—Continued:</i>							
70	Engr dep co.....	5-267D	345.5	1	5		16	15-ton truck-tractor and 40-ton crane not air-transportable. Crushing and screening plant must be disassembled.
				2		3	16	
				3			18	
71	Engr dump trk co.....	5-124D	598.8	1	38		17	
				2		18	17	
				3			30	
72	Engr fld maint co.....	5-157C	380.8	1	21		12	
				2		13	12	
				3			19	
73	Engr float brg co.....	5-78E	(²)	1	63		67	
				2		42	67	
				3			98	
74	Engr hv eqp co.....	5-328R	1,192.0	1	26		52	
				2		15	52	
				3			60	
75	Engr LE co.....	5-54D	(²)	1	25		69	
				2		17	69	
				3			79	
76	Engr LE co, abn.....	5-54D	(²)	1	34		40	
				2		31	40	
				3			55	
77	Engr PNLBRG co.....	5-137D	568.8	1	65		5	
				2		43	5	
				3			31	
78	Engr parts dep co.....	5-279D	250.3	1	21		6	
				2		10	6	
				3			13	
79	Engr SUPPT co.....	5-48D	200.5	1	5		9	
				2		4	9	
				3			10	
80	Engr WS co.....	5-67D	302.5	1	31		5	
				2		23	5	
				3			18	
81	Engr base map dep co.....	5-344R	76.8	1	9			
				2		5		
				3			3	
82	Engr co, REDSTONE.....	5-214D	1,273.5	1	14		61	
				2		9	61	
				3			66	
83	Engr co svc HQ team (AC).....	5-500C	(²)	1	2			
				2		1		
				3			1	
84	Engr sp eqp maint team (EC).....	5-500C	21.5	1	1		1	
				2		1	1	
				3			2	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Engineer—Continued:</i>							
85	Engr fld maint team (NIKE-smb) (EF).	5-500C	47.8	1	2		2	
				2		1	2	
				3			3	
86	Engr fld maint team GM/CORPORAL (EG).	5-500C	36.5	1	3		1	
				2		2	1	
				3			2	
87	Engr fftg teams (FA, FB, FD, and FE).	5-500C	9.3	1	2			
				2		1		
				3			1	
88	Engr until team (HG).....	5-500C	125.8	1	10		3	
				2		5	3	
				3			7	
89	Engr tech intel coll team (IG).....	5-500C	5.3	1	1			
				2		1		
				3			1	
90	Engr tech intel rsch team (IH).....	5-500C	12.3	1	2			
				2		1		
				3			1	
91	Engr terrain team (IK).....	5-500C	11.3	1	2			
				2		1		
				3			1	
	<i>Infantry:</i>							
92	HQ & HQ co, inf bde, sep.....	7-52D	531.5	1	37		14	3
				2		20	14	
				3			27	
93	Inf BG, sep.....	7-11D	(2)	1	105		10	Tanks, combat, full-tracked, light-gun, not air-transportable.
				2		71	10	
				3			47	
94	Armd inf bn, sep.....	7-25D	2,208.0	1	41		100	Equipped with M59 personnel carrier and M84 heavy mortar carrier, self-propelled. Tank recovery vehicle, medium, not air-transportable.
				2		27	100	
				3			114	
95	HQ & HQ co, armd inf bn, sep.....	7-26D	708.0	1	18		32	
				2		11	32	
				3			38	
96	Rifle co, armd inf bn, sep.....	7-27D	375.0	1	6		17	
				2		3	17	
				3			19	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
97	<i>Engineer—Continued:</i> Armd inf bn, sep.....	7-25D	1,560.0	(7)	-----	-----	100	Equipped with M113 personnel carrier and T257 heavy mortar carrier, self-propelled. Tank recovery vehicle, medium, not air-transportable
98	HQ & HQ co, armd inf bn, sep.....	7-26D	600.0	(7)	-----	-----	32	
99	Rifle co, armd inf bn, sep.....	7-27D	240.0	(7)	-----	-----	17	
100	<i>Medical:</i> HQ & HQ det, med gp.....	8-22C	33.8	1 2 3	5 ----- -----	----- 3 -----	----- ----- 2	Assumes two ¾-ton ambulances equal one C-119 load. (3)
101	HQ & HQ det, med bn, sep.....	8-26C	36.9	1 2 3	6 ----- -----	----- 3 -----	----- ----- 2	
102	Med coll co.....	8-129D	61.2	1 2 3	9 ----- -----	----- 5 -----	----- ----- 4	
103	Med clr co, sep.....	8-28R	189.5	1 2 3	28 ----- -----	----- 13 -----	----- ----- 10	
104	Med holding co.....	8-57D	80.9	1 2 3	12 ----- -----	----- 6 -----	----- ----- 4	
105	PVNTMED co.....	8-117R	91.9	1 2 3	14 ----- -----	----- 7 -----	----- ----- 5	
106	Med amb co.....	8-127D	164.8	1 2 3	25 ----- -----	----- 12 -----	----- ----- 10	
107	Med air amb co.....	8-137D	163.0	1 2 3	23 ----- -----	----- 12 -----	1 1 10	
108	Mbl army surg hosp, 60-bed.....	8-571R	156.7	1 2 3	23 ----- -----	----- 12 -----	----- ----- 8	
109	Evac hosp, smbl.....	8-581R	293.1	1 2 3	44 ----- -----	----- 18 -----	----- ----- 15	
110	Fld hosp.....	8-510D	(2)	1 2 3	25 ----- -----	----- 16 -----	----- ----- 9	
111	Conv cen, army.....	8-590D	254.8	1 2 3	38 ----- -----	----- 18 -----	----- ----- 13	

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1	1	2	3	4	5	6	7	6
	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Medical—Continued:</i>							
112	Army med dep.....	8-667R	249.8	1	37			
				2		20		
				3			13	
113	HQ, vet svc (AF).....	8-500C	(2)	1	1			
				2		1		
				3			1	
114	HQ, professional svc unit (AG).....	8-500C	6.6	1	1			
				2		1		
				3			1	
115	Med sup det (FC).....	8-500C	(2)	1	4			
				2		3		
				3			2	
116	Opt det (GA).....	8-500C	(2)	1	2			
				2		2		
				3			1	
117	Opt det (GB).....	8-500C	(2)	1	1			
				2		1		
				3			1	
118	Med eqp maint det (GC).....	8-500C	(2)	1	1			
				2		1		
				3			1	
119	Vet food insp det (JA).....	8-500C	3.7	1	1			
				2		1		
				3			1	
120	Vet food insp svc det (JB).....	8-500C	31.9	1	6			
				2		3		
				3			2	
121	Surg det (KA).....	8-500C	4.6	1	1			
				2		1		
				3			1	
122	Ortho det (KB).....	8-500C	4.5	1	1			
				2		1		
				3			1	
123	Shock det (KC).....	8-500C	5.2	1	1			
				2		1		
				3			1	
124	Maxillo-facial det (KD).....	8-500C	4.6	1	1			
				2		1		
				3			1	
125	Neurosurgical det (KE).....	8-500C	4.6	1	1			
				2		1		
				3			1	
126	Thoracic det (KF).....	8-500C	4.6	1	1			
				2		1		
				3			1	
127	Gus det (KG).....	8-500C	38.4	1	6			
				2		3		
				3			2	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
128	<i>Medical—Continued:</i> Den svc det (KJ).....	8-500C	33.9	1 2 3	6	4	2	
129	Den prosthetic det (KK).....	8-500C	8.4	1 2 3	2	1	1	
130	Psychiatric det (KO).....	8-500C	19.6	1 2 3	3	2	1	
131	Gen disp (MA).....	8-500C	16.1	1 2 3	3	2	1	
132	Med det (OA).....	8-500C	11.1	1 2 3	2	1	1	
133	Med intel det (QA).....	8-500C	2.4	1 2 3	1	1	1	
134	<i>Military Intelligence:</i> MI bn, fld army (—3 corps and 12 div det).	30-15D	(²)	1 2 3	95	58	2 2 35	
135	MI det, corps or abn corps.....	30-18D	(²)	1 2 3	13	8	6	
136	MI det, div.....	30-17D	(²)	1 2 3	12	7	4	
137	HQ & HQ det, air recon spt bn.....	51-16C	(²)	1 2 3	10	6	4	
138	PI co.....	30-79C	(²)	1 2 3	22	18	1 8	Organic to air recon spt bn, TOE 51-15C.
139	<i>Military police:</i> HQ & HQ det, MP gp (AE).....	19-500R	20.7	1 2 3	5	5	2	
140	HQ & HQ det, MP bn, army.....	19-36D	62.6	1 2 3	11	10	4	
141	MP co, corps, abn corps, or army...	19-37D	110.9	1 2 3	21	15	6	
142	MP co, corps, abn corps, or army (aug).	19-37D	112.8	1 2 3	21	15	6	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Military Police—Continued:</i>							
143	HQ & HQ det, MP bn (A1D, NA)---	19-500R	31.3	1	6			
				2		6		
				3			3	
144	MP ESCRG co-----	19-471D	75.6	1	13			
				2		7		
				3			4	
145	MP grd co-----	19-247C	31.0	1	6			
				2		3		
				3			2	
146	MP det, stockade (NA, 2 NB)-----	19-500R	23.0	1	4			
				2		3		
				3			2	
147	MP det, crime inves (M1D)-----	19-500R	11.4	1	3			
				2		3		
				3			2	
148	MP det, crime inves (MF)-----	19-500R	24.6	1	6			
				2		6		
				3			3	
	<i>Ordnance:</i>							
149	HQ & HQ co, ord gp-----	9-12P						
150	HQ & HQ det, ord maint and sup gp-----	9-12D	66.0	1	10			Data not available.
				2		5		
				3			4	
151	HQ & HQ co, ord ammo gp-----	9-221D	265.0	1	39			
				2		18		
				3			14	
152	HQ & HQ det, ord maint and sup bn-----	9-76D	42.0	1	7			
				2		3		
				3			3	
153	HQ & HQ det, ord ammo bn-----	9-861D	68.0	1	11			
				2		6		
				3			4	
154	Ord ammo co-----	9-17D	507.0	1	48			9
				2		22		9
				3				26
155	Ord dir autmv spt co-----	9-127D	448.0	1	45			7
				2		23		7
				3				23
156	Ord DS co-----	9-71D	407.0	1	45			8
				2		29		8
				3				24
								Semitrailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor primemover not loaded).
157	Ord fld sup co-----	9-57D	629.0	1	69			8
				2		34		8
				3				32

Data not available.

Semitrailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor primemover not loaded).

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Ordinance—Continued:</i>							
158	Ord SW and msl DS co.....	9-47D	1,294.0	1	128		12	Semitrailer, tank transporter, 50-ton, not air-transportable (10-ton truck-tractor prime mover not loaded).
				2		85	12	
				3			62	
159	Ord SW and msl GS co.....	9-87D	735.0	1	62		7	
				2		41	7	
				3			36	
160	Ord GS co.....	9-9D	723.0	1	62		12	
				2		28	12	
				3			32	
161	Ord gen autmv spt co.....	9-197D	630.0	1	60		11	
				2		28	11	
				3			32	
162	Ord park co.....	9-137D	266.0	1	21		3	
				2		13	3	
				3			11	
163	Ord coll and clas co.....	9-167D	459.0	1	17		5	
				2		8	5	
				3			11	
164	Ord tire rep co.....	9-117T	(2)	1	34		6	
				2		25	6	
				3			19	
165	Ord GM GS co.....	9-227D	(2)	1	28		16	
				2		21	16	
				3			26	
166	Ord co, REDSTONE.....	9-217T	809.0	1	74		10	
				2		49	10	
				3			39	
167	Ord det, EOD (AA).....	9-510R	21.0	1	3			
				2		2		
				3			1	
168	Ord det, EOD, aug (AB).....	9-510R	19.0	1	4			
				2		2		
				3			2	
169	Ord det, EOD, con (AC).....	9-510R	19.0	1	3			
				2		2		
				3			1	
170	Ord det, ballistic and tech svc (BA).....	9-510R	25.0	1	3			
				2		2		
				3			1	

See footnotes at end of table.

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	1	2	3	4	5	5	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Ordnance—Continued:</i>							
171	Ord det, tech intel (BB).....	9-510R	4.0	1	1			
				2		1		
				3			1	
172	Ord det, tech intel, con (BC).....	9-510R	9.0	1	2			
				2		1		
				3			1	
173	Ord det, hv arty metal rep (CF)....	9-510R	66.0	1	4			2
				2		2		2
				3				4
174	Ord team, NIKE GS (EA).....	9-500R	167.0	1	22			1
				2		10		1
				3				9
175	Ord team, CORPORAL GS (EB)....	9-500R	(2)	1	15			4
				2		10		4
				3				9
176	Ord det, GM DS (NIKE-AJAX/ HERCULES) (FA).	9-510R	228.0	1	23			3
				2		15		3
				3				11
177	Ord det, GM, DS (CORPORAL) (FB).	9-510R	156.0	1	15			2
				2		10		2
				3				8
178	Ord det, GM, DS (LACROSSE) (FD).	9-510R	(2)	1	4			4
				2		3		4
				3				6
179	Ord det, GM, DS (HAWK) (FE)...	9-510T	(2)	1	6			4
				2		5		4
				3				7
180	Ord det, GM, GS (LACROSSE) (FF).	9-510T	(2)	43				2
181	Ord det, GM, GS (HAWK) (F-)....	9-510P	(2)	43				5
	<i>Quartermaster:</i>							
182	HQ & HQ det, QM gp.....	10-221D	36.6	1	6			
				2		3		
				3				2
183	HQ & HQ det, QM DS bn.....	10-106P	37.3	1	6			
				2		3		
				3				2
184	QM DS co (aug).....	10-107P	589.5	1	71			8
				2		37		8
				3				32
185	HQ & HQ det, QM GS bn.....	10-446P	41.5	1	7			
				2		3		
				3				3
186	QM fld dep co.....	10-447P	744.5	1	42			32
				2		15		32
				3				44
187	QM fld maint and sve co.....	10-448P	186.4	1	33			3
				2		20		3
				3				15

See footnotes at end of table

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	Quartermaster—Continued:							
188	QM svc co.....	10-449P	82.8	1	13			
				2		6		
				3			5	
189	HQ & HQ det, QM bn.....	10-536D	35.2	1	6			
				2		3		
				3			2	
190	QM svc co.....	10-67C	33.7	1	5			
				2		3		
				3			2	
191	QM petrl sup co, mbl.....	10-77D	589.0	1	38		17	
				2		35	17	
				3			30	
192	QM bkry co.....	10-147D	342.0	1	35		3	
				2		23	3	
				3			17	
193	QM sales co.....	10-157D	264.8	1	30		3	
				2		17	3	
				3			14	
194	QM ldry co.....	10-167D	234.6	1	36			
				2		29		
				3			14	
195	QM salv co.....	10-187D	97.7	1	15			
				2		8		
				3			5	
196	QM subs sup co.....	10-197C	119.5	1	18			
				2		9		
				3			6	
197	QM clo and GSD co.....	10-227D	341.8	1	51			
				2		24		
				3			17	
198	QM refrg co.....	10-247C	701.4	43			39	
199	QM clo exch and bath co.....	10-257D	104.7	1	16			
				2		9		
				3			6	
200	QM GRREG co.....	10-297D	153.6	1	25			
				2		18		
				3			9	
201	QM fld maint co, DS.....	10-347D	302.7	1	44			
				2		23		
				3			15	
202	QM fld maint co, GS.....	10-348D	286.5	1	40		1	
				2		23	1	
				3			15	
203	QM subs dep co.....	10-357C	383.1	1	57			
				2		27		
				3			19	
204	QM petrl dep co.....	10-377D	619.1	1	38		18	
				2		18	18	
				3			31	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Quartermaster—Continued:</i>							
205	QM aerial sup co.....	10-407D	287.9	1 2 3	28 ----- -----	----- 13 -----	2 2 12	Truck, forklift, 15,000-lb capacity, not air-transportable.
206	QM petrl prob lab det (mbl) (KC)...	10-500R	30.3	1 2 3	2 ----- -----	----- 1 -----	1 1 2	
	<i>Signal:</i>							
207	HQ & HQ det, sig gp.....	11-22D	44.2	1 2 3	5 ----- -----	----- 3 -----	2 2 3	
208	HQ & HQ det, cmbt area sig gp, army.	11-32D	86.5	1 2 3	6 ----- -----	----- 3 -----	4 4 6	
209	HQ & HQ co, army sig bn.....	11-96D	(²)	1 2 3	18 ----- -----	----- 11 -----	4 4 11	
210	Sig comd op co, army sig bn.....	11-97D	(²)	1 2 3	59 ----- -----	----- 32 -----	42 42 62	
211	Sig fld op co, army sig bn.....	11-98D	(²)	1 2 3	125 ----- -----	----- 101 -----	26 26 76	
212	Sig spt op co, army sig bn.....	11-99D	(²)	1 2 3	40 ----- -----	----- 30 -----	30 30 44	
213	HQ & HQ co, cmbt area sig bn, army.	11-86D	248.6	1 2 3	16 ----- -----	----- 9 -----	9 9 15	
214	Cmbt area sig co.....	11-87D	493.9	1 2 3	19 ----- -----	----- 12 -----	22 22 29	
215	HQ & HQ det, sig cable const bn....	11-46D	123.2	1 2 3	11 ----- -----	----- 6 -----	4 4 8	
216	Sig cable const co.....	11-47D	564.8	1 2 3	36 ----- -----	----- 19 -----	21 21 34	
217	HQ & HQ det, army sig sup and maint bn.	11-156D	104.0	1 2 3	4 ----- -----	----- 2 -----	5 5 7	
218	Sig fwd sup and maint co.....	11-157D	388.2	1 2 3	24 ----- -----	----- 9 -----	14 14 22	
219	Sig dep co.....	11-158D	313.6	1 2 3	14 ----- -----	----- 8 -----	12 12 18	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Signal—Continued:</i>							
220	HQ & HQ co, corps sig bn or sig bn, abn corps.	11-16D	190.3	1	11		10	
				2		7	10	
				3			14	
221	Comd op co, corps sig bn or sig bn, abn corps.	11-17D	640.2	1	17		26	
				2		17	26	
				3			37	
222	Fld op co, corps sig bn or sig bn, abn corps.	11-18D	973.1	1	21		42	
				2		10	42	
				3			51	
223	HQ & HQ det, cmbt EW sig bn, corps.	11-66D	76.1	1	4		4	
				2		2	4	
				3			6	
224	Cmbt EW sig co, inf.....	11-67D	340.5	1	24		9	
				2		13	9	
				3			17	
225	Cmbt EW sig co, armd.....	11-68D	438.2	1	9		20	
				2		5	20	
				3			23	
226	HQ & HQ det, AD EW sig bn, army.	11-166D	118.9	1	10		4	
				2		5	4	
				3			7	
227	AD EW sig co, army.....	11-167D	215.8	1	30		5	
				2		16	5	
				3			15	
228	Sig comm cen op co.....	11-137D	422.2	1	36		14	
				2		18	14	
				3			25	
229	Sig air photo repro and dlvr co.....	11-54D	(²)	1	21		3	(³)
				2		13	3	Organic to air recon
				3			10	spt bn, TOE 51-15C.
230	Sig det, auto data proc sys (med) (AF).	11-500P						Data not available.
231	Sig det, auto data proc sys (small) (AG).	11-500P						Data not available.
232	Sig det, crypto distr and acctg (NA).	11-500R	(²)	1	2			
				2		1		
				3			1	
233	Sig det, crypto sup and maint (NB).	11-500R	(²)	43			2	
234	Sig det, intel off sec (TA).....	11-500R	(²)	1	1			
				2		1		
				3			1	
235	Sig det, intel coll (TB).....	11-500R	(²)	1	2			
				2		1		
				3			1	
236	Sig det, intel off sec (TC).....	11-500R	(²)	1	2			
				2		1		
				3			1	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Signal—Continued:</i>							
237	Sig det, eqp eval (TD)-----	11-500R	(²)	1 2 3	1 ----- -----	----- 1 -----	----- ----- 1	
238	Sig det, radar maint unit, type E (RQ).	11-500R	(²)	43	----- ----- -----	----- ----- -----	----- ----- 1	
239	Sig det, AD sys maint (ADA gp) (RS).	11-500R	(²)	1 2 3	4 ----- -----	----- 3 -----	1 1 2	
240	Sig det, AD sys maint (ADA bn) (RT).	11-500R	(²)	1 2 3	1 ----- -----	----- 1 -----	1 1 2	
	<i>Transportation:</i>							
241	HQ & HQ det, trans Army acft maint and sup gp.	55-452P						(⁶)
242	HQ & HQ det, trans Army acft maint and sup bn (DS, GS, and transport spt).	55-456P						Data not available.
243	HQ & HQ det, trans Army acft maint bn.	55-456R	39.1	1 2 3	9 ----- -----	----- 4 -----	----- ----- 3	
244	Trans Army acft maint and sup co, DS.	55-457P						Data not available.
245	Trans Army acft maint co-----	55-457R	209.0	1 2 3	22 ----- -----	----- 16 -----	4 4 12	
246	Trans Army acft hv maint and sup co.	55-458R	167.8	1 2 3	19 ----- -----	----- 12 -----	2 2 9	
247	Trans Army acft maint and sup co, med cgo acft.	55-468P						(⁶)
248	Trans Army acft maint and sup co, lt cgo acft.	55-469P						(⁶)
249	Trans Army acft sup co, GS-----	55-477P						Data not available.
250	Trans Army acft maint co, airplane, GS.	55-478P						Data not available.
251	Trans Army acft maint co, hel, GS..	55-479P						Data not available.
252	HQ & HQ det, trans trk gp-----	55-12D	49.9	1 2 3	8 ----- -----	----- 4 -----	----- ----- 3	
253	HQ & HQ det, trans trk bn-----	55-16D	50.2	1 2 3	8 ----- -----	----- 4 -----	----- ----- 3	
254	Trans lt trk co (2½-ton)-----	55-17D	526.7	1 2 3	75 ----- -----	----- 65 -----	1 1 27	
255	Trans lt trk co (5-ton)-----	55-17D	719.7	43	----- ----- -----	----- ----- -----	36 ----- -----	
256	Trans med trk co (cgo)-----	55-18D	1,091.6	1 2 3	66 ----- -----	----- 64 -----	32 32 64	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Transportation—Continued:</i>							
257	Trans med trk co (petrl).....	55-18D	1,131.6	43	-----	-----	64	
258	Trans med trk co (refrg).....	55-18D	894.1	43	-----	-----	49	
259	Trans msl transport sqd.....	55-18D	(²)	43	-----	-----	10	
260	Trans car co, army.....	55-19D	210.1	1	35	-----	1	
				2	-----	18	1	
				3	-----	-----	13	
261	Trans cgo carr co (tracked).....	55-27C	185.9	1	28	-----	-----	
				2	-----	13	-----	
				3	-----	-----	10	
262	Trans hv trk co.....	55-28C	-----	-----	-----	-----	-----	(⁵)
263	HQ & HQ det, trans tac carr bn....	55-46D	62.3	1	10	-----	-----	
				2	-----	5	-----	
				3	-----	-----	4	
264	Trans tac carr co.....	55-47D	1,290.3	1	20	-----	57	
				2	-----	10	57	
				3	-----	-----	64	
265	HQ & HQ det, trans air transport gp.	55-52P	-----	-----	-----	-----	-----	(⁶)
266	HQ & HQ det, trans transport acft bn.	55-56D	74.9	1	11	-----	-----	
				2	-----	6	-----	
				3	-----	-----	4	
267	Trans lt hel co.....	55-57D	119.6	1	14	-----	1	
				2	-----	9	1	
				3	-----	-----	5	
268	Trans med hel co.....	55-58T	(²)	1	13	-----	3	(³)
				2	-----	9	3	
				3	-----	-----	9	
269	Trans amph trk co.....	55-137C	392.0	1	6	-----	20	
				2	-----	5	20	
				3	-----	-----	22	
270	HQ & HQ det, trans mov gp.....	-----	(²)	1	7	-----	-----	
				2	-----	5	-----	
				3	-----	-----	3	
	(AE, LF).....	55-500R	-----	-----	-----	-----	-----	
	(CA, DA, DC).....	29-500D	-----	-----	-----	-----	-----	
271	HQ & HQ det, trans mov bn.....	-----	(²)	1	8	-----	-----	
				2	-----	5	-----	
				3	-----	-----	3	
	(AD, LA, 2 LE, 3 LC, 3 LD)---	55-500R	-----	-----	-----	-----	-----	
272	Trans highway reg pt team (GG)....	55-500R	(²)	1	2	-----	-----	
				2	-----	1	-----	
				3	-----	-----	1	
273	Trans intel coll team (HA).....	55-500R	(²)	1	2	-----	-----	
				2	-----	2	-----	
				3	-----	-----	1	
274	Trans intel rsch team (HB).....	55-500R	(²)	1	2	-----	-----	
				2	-----	1	-----	
				3	-----	-----	1	

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	1	2	3	4	5	6	7	8	
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks	
					C-119 ¹	C-130	C-124		
275	<i>U.S. Army Security Agency:</i> HQ, H&S co, USASA gp-----	32-52P	(2)	1 2 3	25 ----- -----	----- 15 -----	5 5 16	(3)	
276	HQ & HQ co, USASA bn-----	32-56P	309.5	1 2 3	43 ----- -----	----- 20 -----	2 2 16		
277	USASA op co (A)-----	32-67P	650.1	1 2 3	89 ----- -----	----- 47 -----	1 1 31		
278	USASA op co (B)-----	32-68P	-----	-----	-----	-----	-----		
279	USASA op co (C)-----	32-69P	-----	-----	-----	-----	-----		
280	USASA proc co-----	32-77P	-----	-----	-----	-----	-----		
281	USASA sec co-----	32-78P	(2)	1 2 3	22 ----- -----	----- 16 -----	4 4 15		
282	USASA div spt co-----	32-57P	361.3	1 2 3	49 ----- -----	----- 26 -----	1 1 19		
									Data not available.
									Data not available.
								Data not available.	

¹ As a rough approximation, C-123's may be substituted for C-119's on a one-for-one basis. (See (3)(b) and (c), p. 143)

² Aircraft requirements based only on weight and dimensions of major items of equipment, to include vehicles and trailers

³ Does not include Army aircraft. Data for computing aircraft requirements for Army aircraft are contained in paragraph 7.44e.

⁴ Not transportable in medium transport aircraft. (See (3)(g)4, p. 144)

⁵ Not air-transportable. (See (3)(g)5, p. 144)

⁶ Unit to be air-transportable, but firm TOE data are not available.

⁷ When equipped with M113's and T257's, battalion aircraft requirements are satisfied by C-124's, which are required to transport items of equipment weighing in excess of the C-119's allowable cargo load.

(c) Miscellaneous.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
2	<i>Headquarters:</i> HQ & HQ co, army -----	51-1C and 2C	277.0	1	38		1	
				2		18	1	
				3			14	
3	HQ, sp trp, army -----	51-3C	16.0	1	3			
				2		2		
				3			1	
4	HQ & HQ co, corps or abn corps ----	52-1C and 2C	167.0	1	25			
				2		12		
				3			9	
5	<i>Replacement units:</i> HQ & HQ det, repl gp -----	20-52C	38.0	1	6			
				2		3		
				3			2	

See footnotes at end of table.

	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
	<i>Replacement Units—Continued:</i>							
6	HQ & HQ det, repl bn.....	20-56C	34.0	1	6			
				2		3		
				3			2	
7	Repl co.....	20-57C	19.0	1	3			
				2		2		
				3			1	
	<i>Adjutant general:</i>							
8	APU type A.....	12-6051D	11.0	1	2			
				2		1		
				3			1	
9	APU type C.....	12-6051D	20.0	1	3			
				2		2		
				3			1	
10	APU type F.....	12-6051D	23.3	1	3			
				2		2		
				3			2	
11	APU type H.....	12-6051D	33.0	1	3			
				2		2		
				3			1	
12	APU type J.....	12-6051D	35.9	1	6			
				2		3		
				3			2	
13	BPO type O.....	12-5201D	16.0	1	3			
				2		2		
				3			1	
14	BPO type T.....	12-5201D	53.0	1	8			
				2		4		
				3			3	
15	Data proc unit type Z (mbl) (aug)---	12-5101D	77.0	23			4	
16	Data proc unit type Z (consol aug) (mbl).	12-5101D	(³)	23			4	
17	Army band, sep.....	12-1071D	9.0	1	2			
				2		1		
				3			1	
18	Pstl reg det.....	12-471D	(³)	1	3			
				2		2		
				3			1	
19	SPS co.....	12-171D	216.2	1	11		7	
				2		6	7	
				3			11	
	<i>Finance:</i>							
20	Fin disb sec (AC, FL, GA, HB).....	14-5001D	(³)	1	2			
				2		1		
				3			1	

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	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
					C-119 ¹	C-130	C-124	
21	<i>Civil affairs:</i> CA gp (fld army)	41-500D 29-500D	159.0	1 2 3	25 ----- -----	----- 19 -----	----- ----- 8	
22	CA co (corps)	41-500D 29-500D	199.0	1 2 3	32 ----- -----	----- 22 -----	----- ----- 13	
23	CA plat (div)	41-500D	32.0	1 2 3	6 ----- -----	----- 4 -----	----- ----- 3	
24	<i>Judge Advocate General Corps:</i> JAGC det HQ team (AA)	27-500D	(³)	1 2 3	1 ----- -----	----- 1 -----	----- ----- 1	
25	JAGC det HQ team (AB)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
26	JAGC claims svc team (FA)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
27	JAGC claims svc team (FB)	27-500D	(³)	1 2 3	2 ----- -----	----- 2 -----	----- ----- 1	
28	JAGC war crimes team (GA)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
29	JAGC war crimes team (GB)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
30	JAGC GCM trial team (HA)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
31	JAGC GCM trial team (HB)	27-500D	(³)	1 2 3	2 ----- -----	----- 1 -----	----- ----- 1	
32	JAGC legal asst team (IA)	27-500D	(³)	1 2 3	1 ----- -----	----- 1 -----	----- ----- 1	
33	JAGC legal asst team (IB)	27-500D	(³)	1 2 3	1 ----- -----	----- 1 -----	----- ----- 1	
34	<i>Special warfare:</i> Psych warfare loud-speaker and leaflet co.	33-77D	(³)	1 2 3	22 ----- -----	----- 14 -----	3 3 12	
35	Psych warfare consol co (AC, 3 AA, 3 FA, 12 HA, 3 IA, KA, 3 MA).	33-600D	(³)	1 2 3	44 ----- -----	----- 26 -----	----- ----- 15	

See footnotes at end of table

1	2	3	4	5	6	7	8
Unit	TOE	Weight of personnel, equipment, and supplies (short tons)	Type aircraft combination	Aircraft requirements			Remarks
				C-119 ¹	C-130	C-124	
<i>Historical:</i>							
36 Mil hist det.	12-17D	(³)	1	1			
			2		1		
			3			1	
<i>Public information:</i>							
37 Press camp HQ team (AA).....	45-500D	(³)	1	2			
			2		1		
			3			1	
38 Pub info op team (BA).....	45-500D	(³)	1	1			
			2		1		
			3			1	
39 Cmbt correspondent team (BD).....	45-500D						Only one individual with personal equipment.
40 Pub info op team (aug) (BE).....	45-500D	(³)	1	1			
			2		1		
			3			1	
41 Pub info op team (aug) (BF).....	45-500D	(³)	1	1			
			2		1		
			3			1	

¹ As a rough approximation, C-123's may be substituted for C-119's on a one-for-one basis. (See (3)(b) and (c), p. 143)

² Not transportable in medium transport aircraft. (See (3)(d)4, p. 144)

³ Aircraft requirements based only on weight and dimensions of major items of equipment, to include vehicles and trailers

4.13. Movement by Water

a. General. Capacities of ships and craft, sea distances, steaming rates, turnaround times, and factors for cargo shipping are contained in chapter 7.

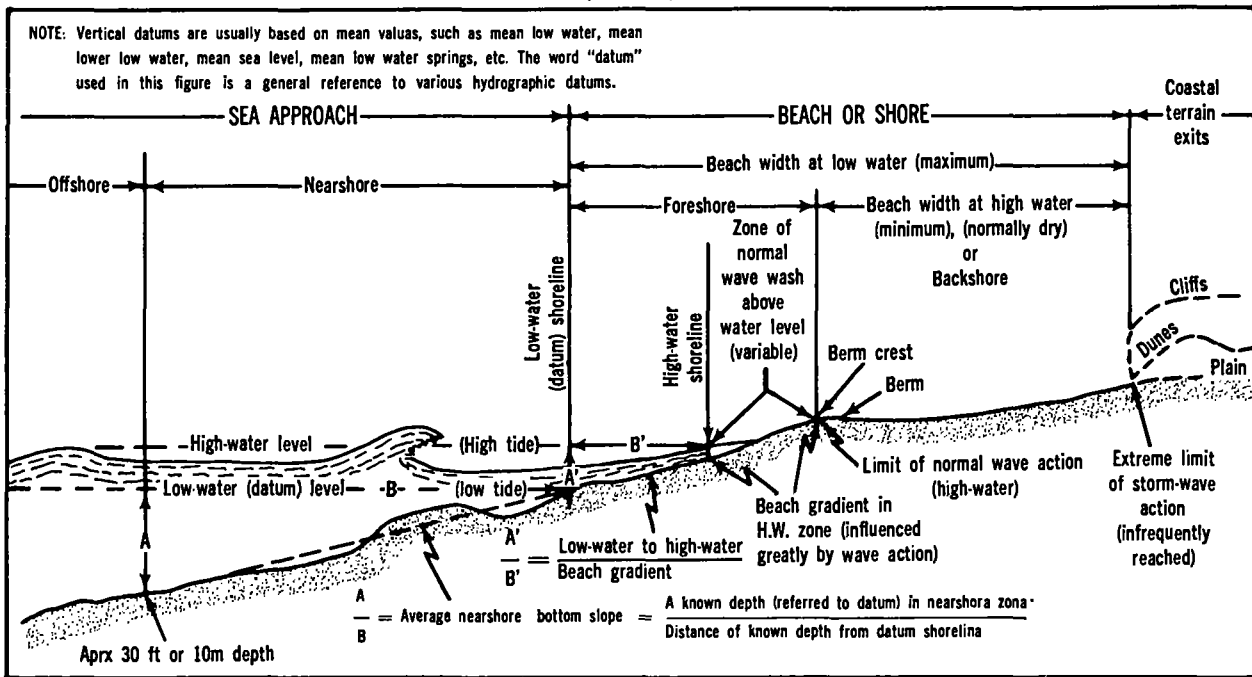
b. Assault Landings Over Beaches.

(1) *Beach analysis and selection.* Strategic considerations aside, the selection of a beach for an assault landing is based upon the potential of the beach and hinterland to permit the initial landing and the followup logistical support of the forces required for the operation. From a logistical standpoint, the most important considerations are the characteristics of the beach, beach exits, and hinterland and the forecast weather conditions as they influence the ability of the service forces to support and maintain the forces ashore. Increased use of helicopters and amphibious vehicles

makes possible the use of less desirable beach areas in the initial assault. Under new concepts of operation and with the employment of nuclear weapons, dispersal of forces and supplies will be necessary; therefore, emphasis will be placed on the analysis and selection of many small beaches, adequately linked by lines of communication, rather than a few long ones as in the past.

(2) *Considerations in selecting.* A detailed investigation and thorough study should be made of the hydrography and topography of the landing area, as well as of the long-range forecasts of the weather that may be encountered. The factors of primary importance to be considered when selecting beaches for assault landings are as follows (the diagram below depicts certain of the features discussed):

GENERAL BEACH PROFILE DIAGRAM
(TIDAL SEA)



- (a) *Tides.* The stages of the tide, the tidal range, and the tidal currents are considered as they affect the passage of underwater obstacles, offshore bars, reefs, or shoals, the beaching or stranding of landing craft, and the width of the beach available for operations.

(b) *Surf.*

1. Waves breaking onto a beach (surf) may cause landing craft to broach to. This necessitates a study of surf in connection with landing operations. Surf action is dependent on wind, tide, and the depth of water. On flat nearshore bottoms, waves break and are spent before reaching the shoreline. Over steep slopes, the surf breaks near the shore and consequently will have more effect on the beaching of craft. Waves usually break over reefs where they exist, and thus leave the inner area relatively unaffected. Surf conditions can be predicted

or forecast hours, and in some cases days, in advance for almost all shores of ocean areas for which regular weather reports are received. Waves created by distant storms may break on a shore with a high or heavy surf, even while local weather conditions are otherwise ideal. Surf forecasts should cover the entire operation and should be available for use as long as any operations across the unprotected beaches are necessary.

2. LVTP-5's and BARC's can operate satisfactorily in a surf up to 8 feet. LCVP's can operate satisfactorily in a surf of 2 to 3 feet, DUKW's in a surf up to 6 feet; in greater surfs, operations should be undertaken only in an emergency. LCM(6)'s can operate satisfactorily in a surf of 3 to 4 feet. LCM(8)'s can operate satisfactorily in a surf of 4 to 5 feet.

- (c) *Nearshore bottom gradient.* Gently

sloping bottom gradients cause landing craft to ground at a considerable distance from the shoreline, which increases the hazard and time of unloading. Beaches with steep gradients are subject to heavy surf. Since a steep gradient usually extends shoreward from the waterline, difficulty in moving vehicles and cargo off the beach can be anticipated. A beach gradient of 1 to 30 (1 foot increase in water depth each 30 feet seaward from the waterline) is nearly ideal for the operation of landing craft and amphibious vehicles.

- (d) *Reefs.* In many places, reefs or shoals fringe the shorelines and must be studied prior to beaching operations. A minimum depth of water of 4 feet should be available over reefs or shoals at low tide to permit the low-water operation of landing craft. This is not the normal situation since most reefs are either very close to the surface or entirely exposed at low tide, in which case certain craft must operate at high tide only. A minimum depth of water of 11 feet at low tide is required for the operation of LST's. Reefs or shoals which limit operations should be avoided in the selection of beach sites.
- (e) *Weather.* Predicted weather conditions must be considered in relation to the projected operation. Adverse weather conditions and their effects upon tide and surf may make operations too hazardous, or impossible. Haze or fog conditions may be advantageous or disadvantageous, depending on overall considerations of the operation in question. The weather considerations should cover the entire operation and insure favorable conditions for not only the assault landings but also the followup and buildup phases.

- (f) *Topographic.* Having effected a lodgment ashore, the landing forces will be confronted with expanding the beachhead and general movement inland. Here topographic features are of immediate importance. Consideration should be given to overall length of beach; degree of access to the interior from the beach (number of corridors and utility of each, the existing road net and means of reaching it from the beach); areas suitable for supply dumps (both in the beach area and inland); areas suitable for airstrips, airdrops, helicopter landing sites, and cover and concealment. It is important that each of these factors be analyzed with respect to the advantages or disadvantages that a particular site may offer.
- (g) *Equipment.* Requirements for equipment to unload supplies over the beach must be determined by beach characteristics. If available equipment will not be adequate, early effort must be directed toward the procurement of sufficient amounts of the proper types.
- (h) *Enemy action.* This may take either an active or a passive form. Active enemy action includes the use of existing defense installations, established fields of fire, and employment of the defending forces. Enemy air and naval capabilities also must be considered. Passive enemy action includes obstacles, demolitions, and mines in water adjacent to the beach, on the beach, and immediately inland. All these will affect the ability of the service troops to furnish the necessary logistical support.
- (i) *Troop availability.* An analysis must be made of troops available for the operation which will include the degree of training, experience, and general suitability of both combat

and service elements for the operation under consideration.

- (j) *Time.* The time and place for launching an operation are decided after an analysis of the factors discussed in (a) through (i) above. In addition, the exact time (week, day, and hour) for the assault will be influenced by visibility (as it affects surprise and operations) in the relative number of hours of darkness, moonlight, and daylight. Whether the landing is made in darkness or daylight is determined largely by the relative effectiveness of the fire and support of the assaulting and defending forces.

(3) *Beach capacity for assault landing.*

- (a) *Size of beaches.* The number of troops which can be landed simultaneously in assault over a given beach is the result of a combination of factors. The tactical formation employed by the assault troops should be the dominant factor, providing safety precautions and good judgment are not sacrificed. In general, the length of beach employed for landing an infantry battle group will approximate 1,000 meters.

- (b) *Time and space factors for landing craft and amphibious vehicles.* The

interval between landing craft or amphibious vehicles landed simultaneously on a beach will vary from 45 meters to 90 meters, or an average of 68 meters. The time interval between waves will vary from 1 minute to 15 minutes.

- (c) *Average landing times.* The battle group landing team of approximately 1,700 men requires an average of 50 amphibious vehicles or 42 landing craft (LCVP). About 2 hours is required to land a battle group landing team over one landing beach.

- (d) *Assault shipping requirements.* Assault shipping required for a reinforced infantry division varies according to the tactical mission and the length of the voyage.

1. For long voyages (10 days, for example), primary consideration must be given to provision of the type of shipping that will negotiate the distance at a suitable speed and that will best accommodate the embarked troops. APA's and AKA's meet these requirements better than landing ships. Assault shipping for a reinforced infantry division for an extended voyage, therefore, conforms to the following general pattern:

	1	2	3	4	5	6
1	Type ship	Personnel	Vehicles	No. of ships	Total personnel	Total vehicles
2	APA.....	1,500	50	10	15,000	500
3	AKA.....	300	120	2	600	240
4	LST ¹	450	60	25	11,250	1,500
5	LSD ¹	200	50	7	1,400	350
6	LPH.....	1,400	0	4	5,600	0
7	Total.....				33,850	2,590

¹ Number of landing ships varies in proportion to number of amphibious vehicles, DUKW's, ground combat vehicles, and LCU's and LCM's to be carried.

2. For short voyages (48-72 hours, for example), accommodation of embarked troops can be subordinated to provision of the most suitable shipping for ease and efficiency in loading and unloading. Landing ships meet these requirements better than APA's

and AKA's, especially when ground combat vehicles and amphibious vehicles are considered. Assault shipping for a reinforced infantry division for a short voyage, therefore, conforms to the following general pattern:

	1	2	3	4	5	6
1	Type ship	Personnel	Vehicles	No. of ships	Total personnel	Total vehicles
2	APA.....	1,500	50	1	1,500	50
3	AKA.....	350	120	2	700	240
4	LST ¹	400	60	50	20,000	3,000
5	LSD ¹	300	50	7	2,100	350
6	LPH.....	2,000	0	4	8,000	0
7	Total.....				32,300	3,540

¹ Number of landing ships varies in proportion to number of amphibious vehicles, DUKW's, ground combat vehicles, and LCU's and LCM's to be carried.

3. The number of vehicles lifted in the assault shipping for a short voyage greatly exceeds the number lifted in the assault shipping for a long voyage. This is because the landing ships carry a balanced personnel and vehicle load as compared with APA's, which carry large numbers of personnel but few vehicles. The increased use of LVT's and helicopters in the ship-to-shore movement will generally increase the use of LST, LSD, and LPH type ships in the amphibious assault, with a resultant decrease in the numbers of APA type ships.

4. Available shipping will always affect the composition of assault shipping. Efficient loading and allowable overloads likewise affect the number of personnel and vehicles that can be loaded. For example, it was common in both Europe and the Pacific in World War II to load 500 troops on LST's.

(e) *Vehicles and supply.* In loading as-

sault craft, vehicles or supplies may be substituted for men on the basis of space or weight, whichever is the determining factor in each case. The boat space occupied by one man and his individual equipment normally is considered to be 224 pounds, 13.5 cubic feet or 3 square feet.

c. *River Crossing.*

- (1) *Bridges.* In an assault on a river line, the number of bridges provided for each tactical unit will vary widely, depending on many factors. Some of these are width of river, stream velocity, the available road net, trafficability of the soil, the types and amounts of equipment available, and the number of available engineer troops. As a rule, at least one floating bridge to take division loads will be necessary within the zone of each assault division. These bridges normally will be supplemented by one additional bridge per corps zone and at least one in the field army zone. Theater army logistical command troops ordinarily will provide a railroad bridge in the zone of each field army.

(2) *Ferries.* In addition to the factors discussed above, the numbers and types of ferries used will be affected by the number of bridges planned and by the extent to which landing craft and amphibious vehicles are employed. For narrow streams, it frequently will be more economical to construct a bridge at each available site than to use fer-

ries. On the other hand, in crossing a wide river when the construction of bridges will be delayed, ferries of all types will be used to the greatest degree possible.

(3) Detailed characteristics of assault boats, bridging, and ferry equipment are shown in paragraphs 4.29 and 4.30.

Section III. TRAINING

4.14. Maneuver Area

a. Current doctrine on the employment of divisions in both nuclear and nonnuclear warfare increases the requirements for training areas in size and for variety in types of terrain, cover, and concealment. The increased versatility and range of infantry, armor, and artillery weapons; the increased use of aircraft for the mobility of divisional units; and the require-

ments for greater dispersion of units within a tactical area have outmoded prior concepts of both field exercise areas and firing and impact areas. Consequently, installations which have previously been utilized for the training of divisions are no longer capable of meeting present-day requirements.

b. Data on installation areas in approximate acreages are as follows:

	1	2	3	4	5	6	7
1	Type units	Approximate number of troops	Cantonment area	Miscellaneous activities area	Field exercise area	Firing and impact area	Total
2	Inf div.....	¹ 30,000	2,200	1,000	50,000	90,000	143,200
3	Armd div.....	¹ 30,000	2,200	1,000	70,000	140,000	213,200
4	Abn div.....	¹ 30,000	2,200	1,000	50,000	² 90,000	143,200
5	Corps troops.....	³ 30,000	2,400	1,000	10,000	40,000	53,400
6	Air defense artillery firing center.	⁴ 2,500	⁴ 250	⁴ 150	⁵ 6,000	⁵ 70,000	76,400
7	Tank firing center....	⁶ 2,500	⁶ 250	⁶ 150	Not required.	140,000	140,400

¹Includes divisional, nondivisional, and supporting troops (aggregate strength).

²Consideration must be given to cleared areas for drop zone and assault transport landing areas. An airdrome capable of taking large transports should be nearby. An airborne division maneuver area should contain an airfield, capable of handling large airplanes, immediately adjacent to the cantonment area. One or more large drop and assault transport landing zones should be located near the cantonment area, and the others scattered throughout the maneuver area. At least one such zone should be located adjacent to the firing and impact area to permit conduct of small-unit problems using live ammunition.

³Normal assignment of corps troops plus one-third of normal field army engineer and field army air defense artillery units.

⁴Per group of 3 AW battalions.

⁵Provides position areas and danger areas for simultaneous firing of the 3 battalions through 45° safety angle. Danger area may be sited over water.

⁶Per 3 tank battalions and proportionate station overhead.

4.15. Training Facilities for Infantry, Airborne, and Armored Divisions

a. The cantonment area should be located near the perimeter of the land available, accessible to highways and railroad facilities. The area should provide all housing, storage, railroad yards, administration, shops, close-in

training areas, miscellaneous training courses, and recreational facilities. For a functional layout of division-type camps, see OCE drawing number E-16-06-21 and E-16-06-22 obtainable from Office, Chief of Engineers. See also appropriate AR's and SR's in the 210 series.

b. The miscellaneous activities area includes

the station hospital, airfields, division review field, and other administrative activities not included in the cantonment area.

c. The field exercise area includes all available land except that used for cantonment, miscellaneous activities, and firing and impact area. Portions of the firing and impact area not in use when the exercises are conducted may be utilized as field exercise area. It is desirable that this area contain streams or lakes for training in construction of fixed and floating bridges. Landing strips for organic aircraft should be located at several places in the field exercise area. The area for an airborne division should contain several cleared areas suitable for use as drop and landing zones.

d. Firing and impact area permits the firing of all ranges simultaneously, except, in some cases, those whose impact areas are superimposed. For suggested layout, see SR 210-20-20. For safety requirements, see AR 385-63. This area should be of varied terrain with suitable locations for ground observation points. The impact area may be submarginal or swamp land.

e. The division review field should be an area at least 240 by 1,500 yards, adjacent to or near the cantonment area.

f. Drill fields should be located in close proximity to each battle group or other major unit area.

g. The landing field should be available in the vicinity of the cantonment area for use by organic aircraft.

h. Four airfields capable of meeting minimum standards under favorable weather conditions for current and planned assault transport aircraft should be provided in the field exercise area for training in air-landed operations.

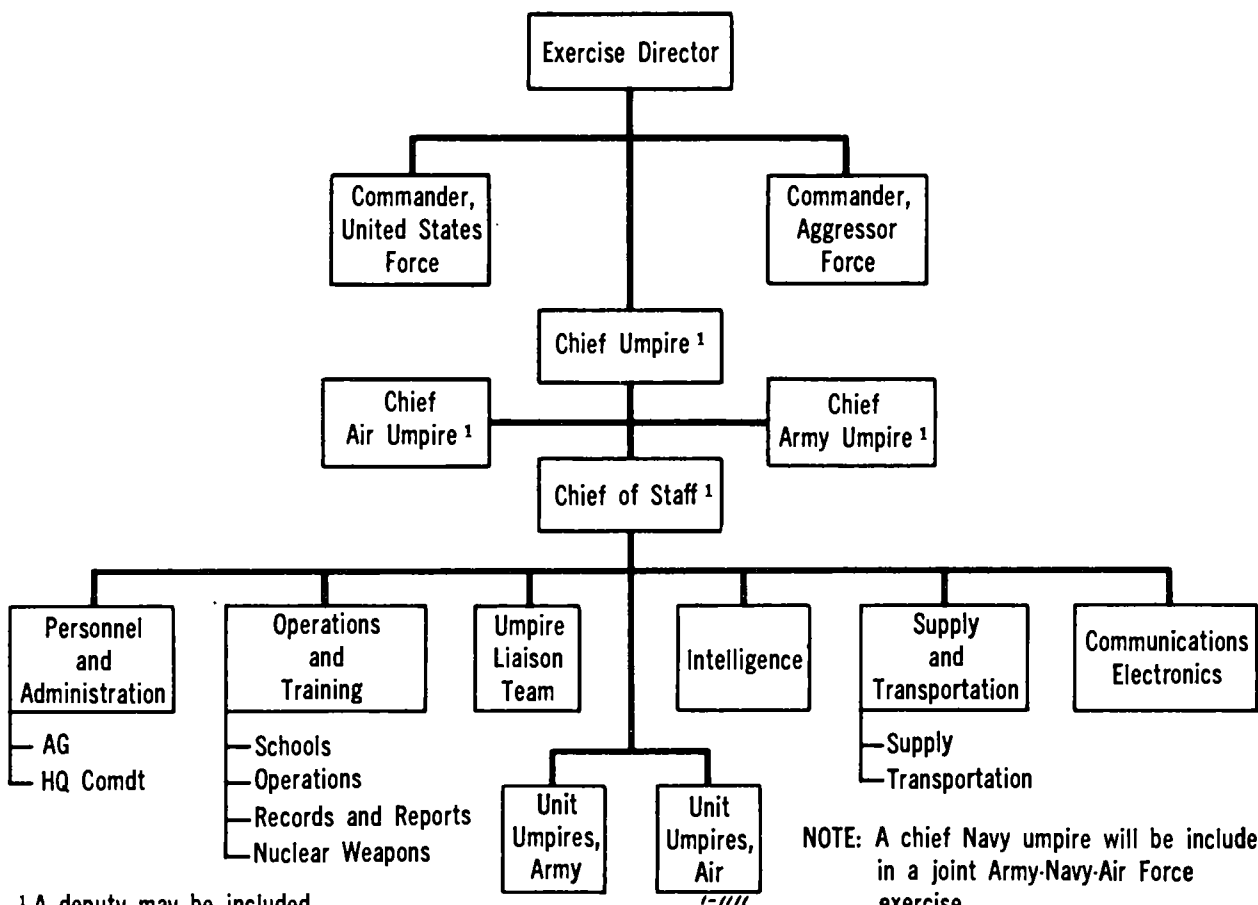
i. An airfield suitable for use by large numbers of transport aircraft should be on or near the installations. It is desirable to have other airfields, suitable for use by Air Force aircraft, within 1 day's march of an airborne division installation.

j. The close-in training area, in order to permit the maximum use, should be located in close proximity to the housing area.

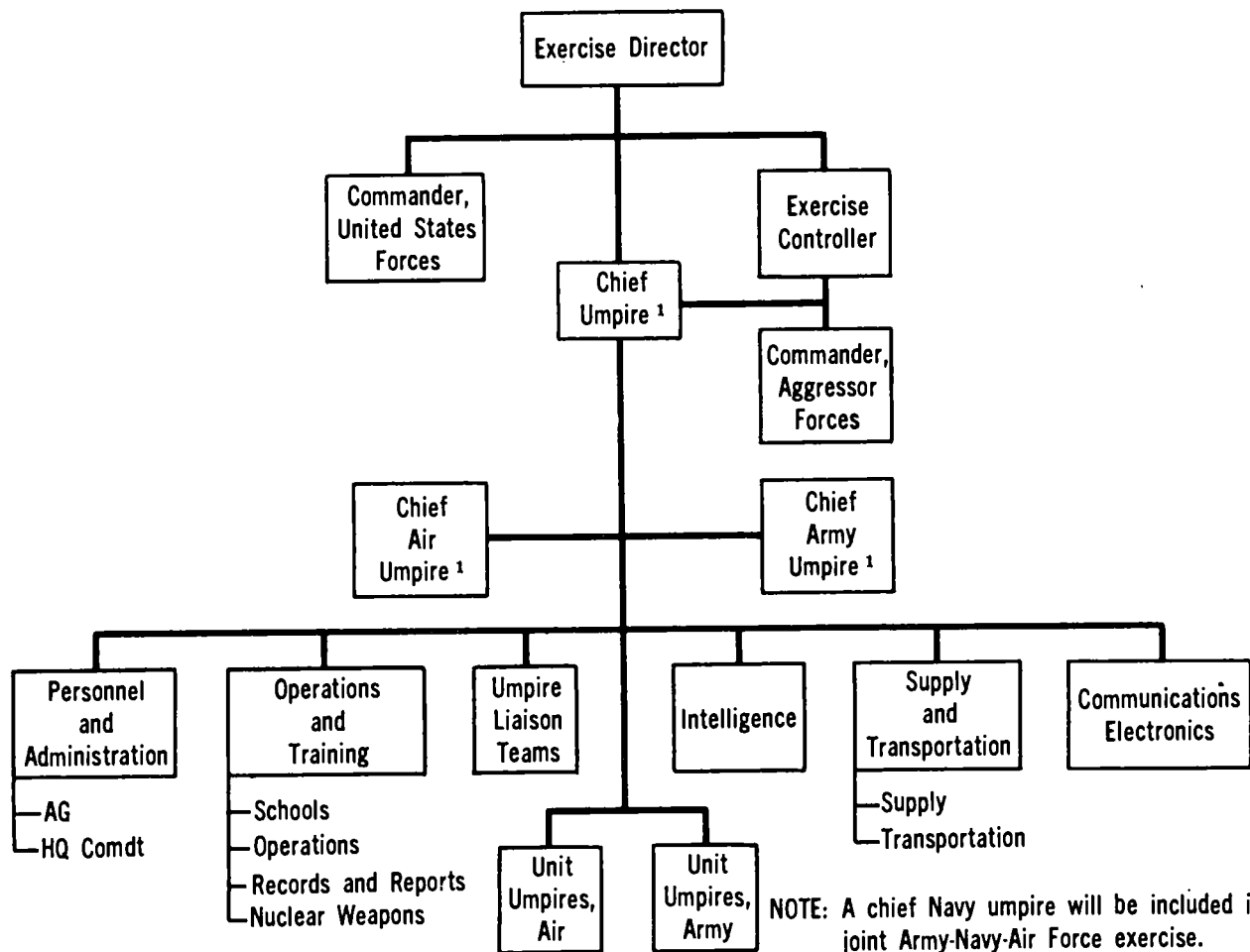
k. Ranges for the infantry, airborne, and armored division posts may be found listed in SR 210-20-20, together with the number of ranges, positions, lanes, bays, or firing points required for each type of unit, also the drawing number from which they may be constructed and the appropriate training manual reference.

4.16 Umpire Organization

a. *Free Exercise.*



b. Controlled Exercise.



¹ A deputy may be included.

4.17. Umpire Requirements

For umpire requirements, see FM 105-5.

Section IV. TACTICAL OPERATIONS

4.18. Characteristics of Weapons

a. Vehicular Weapons, Combat Vehicles (Less Artillery).

1	2	3	4	5
Vehicle	Primary weapon	Sustained rate of fire (rd/min)	Effective range (meters)	Area of burst (HE) (meters)
2 Gun, twin 40-mm, SP, full-tracked, M42A1	Gun, dual auto.	120	5,050	
3 Gun, 90-mm, SP, full-tracked, M56 (abn)	Gun, 90-mm, M54	1	1,850 AP 2,750 HEAT 17,350 HE	37×11
4 Mortar, 4.2-in., SP, full-tracked, M84	Mortar, 4.2-in., M30	¹ 5	5,350	41×14
5 Tank, cmbt, full-tracked, lt gun, M41 and M41A1	Gun, 76-mm, M32	1	1,850 AP 13,700 HE	30×5
6 Tank, cmbt, full-tracked, med gun, M48 and M48A2	Gun, 90-mm, M41	1	1,850 AP 2,750 HEAT 17,350 HE	37×11
M48A1E1	Gun, 105-mm	1	0-2,500 APDS	(²)
7 Tank, cmbt, full-tracked, med gun, M60	Gun, 105-mm	1	0-2,500 APDS	(²)
8 Tank, cmbt, full-tracked, 120-mm gun, M103	Gun, 120-mm, M58	1	1,850 AP 26,950 HE	46×8

¹ First 20 min.² Data will be furnished when available.

b. Infantry Weapons.

1	2	3	4	5	6
Weapon	Maximum rate of fire (rd/min)	Sustained rate of fire (rd/min)	Maximum range (meters)	Maximum effective range (meters)	Effective radius of burst or area covered (meters)
2 Carbine, cal .30, M2	750-775	40-60	2,000	250	
3 Flamethrower, ptbl, M2A1-7		6-9 sec			
4 Unthickened fuel				18	
5 Thickened fuel				48	
6 Flamethrower, ptbl, one-shot, M8		4 sec		73	
7 Grenade, hand, frag, M26A1				¹ 30	15
8 Grenade, hand, WP, M34				¹ 30	25
9 Grenade, rifle, HEAT, M31				115	
10 Gun, mach, cal .30, Bng, M1919A6	675	75	3,200		
11 Air defense				640	
12 Ground				1,100	
13 Gun, mach, cal .30, Bng, M1919A4, flex.	400-550	75	3,200		
14 Air defense				640	
15 Ground				1,100	
16 Gun, mach, cal .50, Bng, M2, hv bbl, flex.	500	40	6,800		
17 Air defense				725	
18 Ground				1,825	
19 Gun, mach, 7.62-mm, M60	550	100	3,750	1,100	

See footnotes at end of table.

	1	2	3	4	5	6
	Weapon	Maximum rate of fire (rd/min)	Sustained rate of fire (rd/min)	Maximum range (meters)	Maximum effective range (meters)	Effective radius of burst or area covered (meters)
20	Gun, submach, cal .45, M3A1-----	450	40-60	1,600	91	-----
21	Launcher, grenade-----	(²)	(²)	(²)	(²)	(²)
22	Launcher, rkt, 3.5-in., M20, M20A1, M20A1B1, M20B1.	12-18	4	823	185-275	18×9
23	Area targets-----				823	-----
24	Point targets-----				366	-----
25	Missile, at/aslt, SS-10 (on ¼-ton trk) ..	2-3	2-3	1,600	1,600	-----
26	Mortar, 81-mm, M29, W mount, or M23A3.					-----
27	Cartridge, HE, M43A1-----	30	18	3,510	3,510	23×14
28	Cartridge, HE, M362-----	12 rd for 2 min W chg 8.	3 rd ea subq min W chg 8.	3,675	3,675	27×18
29	Cartridge, illuminating, M301A1-----			2,070	2,070	Illuminates area 1,150 meters in diam.
30	Cartridge, smoke, WP, M370-----			3,675	3,675	NA
31	Mortar, 4.2-in., M30-----					-----
32	Shell, 4.2-in., HE, M3, M3A1, M329.	15-20	5 rd/20 min	5,486	5,486	45×13
33	Shell, illuminating, M335-----			3,650	3,650	Illuminates area 750 meters in diam.
34	Shell, smoke, WP, M328-----			5,486	5,486	NA
35	Pistol, auto, cal .45, M1911A1-----	21-28	10	1,500	50	-----
36	Rifle, auto, cal .30, Bng, M1918A2-----	350-550	40-60	3,200	460	-----
37	Rifle, US, cal .30, M1, M1C, and M1D-----	16-24	8-10	3,200	³ 460	-----
38	Rifle, 7.62-mm, M14-----	40-60	8-10	3,725	460	-----
39	Rifle, 7.62-mm, M15 (AR)-----	120-150	15-20	3,725	460	-----
40	Rifle, 106-mm, M40A1-----	5-1 per 6 sec	1 indef	7,600	1,828	NA
41	Cartridge, HEAT, 106-mm, M344-----			7,600	⁴ 1,100	-----
42	Cartridge, HEP-T, 106-mm, M346-----			7,600	⁴ 1,100	-----
43	Weapons, apers, M18-----			205	40	-----

¹ Average maximum throwing distance.

² Data will be furnished when available.

³ M1C and M1D maximum effective range 720-910 meters.

⁴ Limit imposed by spotting rifle range.

c. Artillery Weapons.*

(1) Air defense artillery.

	1	2	3	4	5	6	7
1	Weapon	Time to emplace	Maximum rate of fire (rd/min)	Range (meters)			
				Horizontal		Vertical	
				Maxi- mum	Fuse limit	Maxi- mum	Fuse limit
2	ADA missile system, NIKE-AJAX.....	8 hr	1	45,700	-----	18,280	-----
3	ADA missile system, NIKE-HERCULES.....	(1)	(1)	(1)	(1)	(1)	(1)
4	ADA missile system, HAWK.....	(2)	(2)	(2)	(2)	(2)	(2)
5	Gun, twin 40-mm, SP, M42 ³	-----	240	45,050	55,050	5,050	55,050

¹ See DA Pam 44-2.² See DA Pam 44-3.³ Effective killing slant range is approximately 1,200 meters.⁴ For tactical planning, 1,828 meters.⁵ 12-second fuze limit

(2) Field artillery.

	1	2	3	4	5	6	7	8
1	Weapon	Time to emplace (min)	Maximum rate of fire (rd/min) ¹	Projectiles (HE unless otherwise indicated)				
				Effective area of burst (meters) ²		Weight (lb)	Maximum range (meters)	
				Lateral	Range		100 percent	85 percent
2	Gun, 280-mm, M65 ³	12	½	55	59	600	28,517	24,239
3	Howitzer, 105-mm, M2A1 and M2A2 (carriage, M2A2).....	3	4	27	18	33	11,290	9,565
4	Howitzer, 105-mm, SP, full-tracked, M52.....	1	4	27	18	33	11,290	9,565
5	Howitzer, 155-mm, M1 and M1A1 (carriage, M1A2).....	5	3	45	27	95	14,939	12,706
6	Howitzer, 155-mm, M1 and M1A1 (motor carriage, M41).....	1	3	45	27	95	14,939	12,706
7	Howitzer, 155-mm, SP, full-tracked, M44.....	1	3	45	27	95	14,939	12,706
8	Howitzer, 8-in., M2 (motor carriage, M1) ³	20 min to 6 hr	1	73	27	200	16,918	14,380
9	Howitzer, 8-in., SP, full-tracked, M55 ³	1	1½	73	27	200	16,918	14,380
10	Launcher, multiple rkt, 4.5-in., M21.....	5	25	46	14	37.5	8,230	6,996
11	Mortar, 4.2-in., M30.....	1 to 3	15-20	45	13	24.5	5,486	4,750
12	FA rkt, 318-mm ³	-----	-----	-----	-----	800	-----	-----
13	FA rkt, 762-mm ³	25	2 rd/ lchr/ hr	-----	-----	5,800	23,600	20,070
14	FA msl, CORPORAL ³	-----	-----	-----	-----	11,200	128,800	109,500
15	FA msl, REDSTONE ³	-----	-----	-----	-----	61,900	324,400	275,700
16	FA msl, LACROSSE ³	-----	-----	-----	-----	2,360	-----	-----

¹Not applicable for sustained fire.²Burst radius varies with the type of fuze fired, range fired, type of impact area, and weather.³See FM 101-10, part III.⁴Using minimum powder charge.

* For classified characteristics of artillery weapons/weapons systems, see FM 101-10, part III, paragraph 4.7.

(3) *Field artillery barrages and concentrations.*

(a) *Barrages.* A barrage is a special type of prearranged fire placed on a line. The data contained in the following table are approximate and will vary for different charges and terrain.

	1	2	3	4	5	6	7	8	9	10
1	Weapon (caliber and type)	Area effectively covered by one projectile ¹ (width × depth) (meters)	Radius of large fragments (meters)	Width of battery barrages (meters)			Permissible number of rounds per piece			
				Size of battery			1st ½ min	1st 4 min	1st 10 min	Pro- longed fire (rd/hr)
				2-piece	4-piece	6-piece				
2	105-mm howitzer.....	27×18	174	-----	-----	192	2	16	40	120
3	155-mm howitzer.....	45×27	257	-----	-----	310	2	8	30	60
4	8-in. howitzer.....	73×27	475	-----	347	-----	-----	4	10	30
5	280-mm gun, M65.....	55×59	675	205	-----	-----	-----	2	5	20
6	4.2-in. mortar.....	45×13	155	-----	-----	421	10	30	50	60

¹ The area covered effectively is considered to be that area in which there is at least 50 percent chance that a man standing will become a casualty. The area is roughly elliptical.

(b) *Concentrations.* A concentration is a volume of fire placed on an area within a limited time.

	1	2	3	4	5	6
1	Area and ammunition	Unit				Remarks
		4.2-in. mortar bn	105-mm how bn	155-mm how bn	8-in. how bn	
		6-piece btry	6-piece btry	6-piece btry	4-piece btry	
2	Approximate size of area covered (meters). ¹	366×267	219×160	348×210	338×137	Firing with open sheaf.
3	Amount of ammunition to cover (rounds).	-----	72	72	60	

¹ The area covered effectively is considered to be that area in which there is at least 50 percent chance that man standing will become a casualty. The area is roughly elliptical.

4.19. Characteristics of Chemical Weapons, Agents, and Munitions*

a. Characteristics of Chemical Weapons.

1	Weapon	2	3	4	5	6	7	8		9
		Weight		Transportation	Fuel tank capacity (gal)	Fuel consumption rate	Duration of continuous fire (sec)	Maximum effective range		
		Empty (lb)	Filled (lb)					Liquid fuel (meters)	Thickened fuel (meters)	
2	Flamethrower, ptbl, one-shot, M8.	12.5	27	Man-carried.	2	½ gal/sec	4	-----		73
3	Flamethrower, ptbl, M2A1----	43.0	72	Man-carried.	4¾	½ to ¾ gal/sec	6 to 9	18		55-65
4	Flamethrower, ptbl, M2A1-7..	41.0	70	Man-carried.	4½-4¾	½ to ¾ gal/sec	6 to 9	18		48
5	Flamethrower, mechanized, main armt, turret-mtd, M7A1-6.	-----	-----	M48A2 med tk	Aprx 380	6.2 to 6.7 gal/sec	55 to 61	Not recm		Aprx 183
6	Generator, smoke, mech, pulse-jet, M3A1.	137.0	156	¼-ton trk and tlr	-----	-----	Continu-ous	NA		NA
7	Fog oil-----	-----	-----	-----	(1)	25-50 gal/hr	-----	-----	-----	-----
8	Gasoline-----	-----	-----	-----	3½	3 gal/hr	-----	-----	-----	-----
9	Generator, smoke, mech, pulse-jet, M3A2.	173.0	190	¼-ton trk and tlr	-----	-----	Continu-ous	NA		NA
10	Fog oil-----	-----	-----	-----	(1)	25-50 gal/hr	-----	-----	-----	-----
11	Gasoline-----	-----	-----	-----	3½	3 gal/hr	-----	-----	-----	-----
12	Generator, smoke, mech, pulse-jet, M3A3.	130.0	147	¼-ton trk and tlr	-----	-----	Continu-ous	NA		NA
13	Fog oil-----	-----	-----	-----	(1)	25-50 gal/hr	-----	-----	-----	-----
14	Gasoline-----	-----	-----	-----	3½	3 gal/hr	-----	-----	-----	-----
15	Irritant gas disperser, skid-mtd, GED, 5,000 CFM, M2.	550.0	590	¾-ton trk	40 lb	13 lb/min	180	-----	-----	-----

¹ No tank; fog oil used from 3-gallon can or 55-gallon drum.

* For classified data, see FM 101-10, part III, paragraph 4.9

b. Characteristics of Chemical Agents.

(1) *Toxic chemical agents.* See FM 3-8.

(2) *Screening smokes.*

	1	2	3	4	5	6	7
1	Name	Symbol	Marking	Odor	Status ¹	Tactical classification	Possible method of dispersion
2	Fog oil ²	SGF1	SGF OIL	Like petroleum oil.	Std-A	Screening smoke.	Mechanical smoke generator, pot.
3	Hexachlorethane mixture....	SGF2 HC	1 yellow band, HC SMOKE.	Acrid like camphor.	Std-A	Screening smoke.	Bomb, artillery, mortar, grenade, pot.
4	Sulfur trioxide solution ³	FS	1 yellow band, FS SMOKE.	Acrid	Std-A	Screening smoke.	Artillery, mortar, spray.
5	White phosphorus ⁴	WP	1 yellow band, WP SMOKE.	Burning matches.	Std-A	Screening smoke.	Bomb, artillery, mortar, grenade, rocket.
6	Plasticized white phosphorus. ⁴	PWP	1 yellow band, PWP SMOKE.	Burning matches.	Std-A	Screening smoke.	Bomb, artillery mortar, grenade rocket.

¹Std-A—standard-A.

²Fog oil; in two grades—SGF1 and SGF2—is issued by the Quartermaster Corps.

³Liquid FS and FM are corrosive to the skin; smoke irritates the skin.

⁴WP and PWP have secondary classification as incendiary and antipersonnel agents; solid particles burn the skin.

(3) *Signaling smokes.*

	1	2	3	4	5	6	7
1	Name	Symbol	Marking	Odor	Status ¹	Tactical classification	Possible method of dispersion
2	Green smoke.....	GS	1 yellow band, color indicated.	Acrid	Std-A	Signaling	Artillery, grenades.
3	Red smoke.....	RS	1 yellow band, color indicated.	Acrid	Std-A	Signaling	Artillery, grenades.
4	Violet smoke.....	VS	1 yellow band, color indicated.	Acrid	Std-A	Signaling	Artillery, grenades.
5	Yellow smoke.....	YS	1 yellow band, color indicated.	Acrid	Std-A	Signaling	Artillery, grenades.

¹Std-A—standard A.

(4) Incendiary agents.

	1	2	3	4	5	6	7
1	Name	Symbol	Marking	Odor	Status ¹	Tactical classification	Possible method of dispersion
2	Incendiary mixture, PT1 ²	PT1	1 purple band, PT1 INCENDIARY.	Like petroleum oil.	Std-B	Incendiary	Bomb.
3	Incendiary mixture, PTV ³ ...	PTV	1 purple band, PTV INCENDIARY.	Like gasoline.	Std-A	Incendiary	Bomb.
4	Incendiary oil, IM ⁴	IM	1 purple band, IM INCENDIARY.	Like gasoline.	Std-B	Incendiary	Bomb.
5	Incendiary oil, ISO ⁵	ISO	1 purple band, ISO INCENDIARY.	Like gasoline.	Std-A	Incendiary	Flamethrower.
6	Incendiary oil, NP ⁶	NP	1 purple band, NP INCENDIARY.	Like petroleum oil.	Std-B	Incendiary	Bomb, flamethrower.
7	Incendiary oil, NP2 ⁷	NP2	1 purple band, NP2 INCENDIARY.	Like petroleum oil.	Std-A	Incendiary	Bomb.
8	Incendiary oil, NP3 ⁸	NP3	1 purple band	Like kerosene.	Std-A	Incendiary	Fire starter.
9	Thermate, TH3.....	TH3	1 purple band, TH3 INCENDIARY.	None	Std-A	Incendiary	Bomb, grenade.
10	Thermate, TH2.....	TH2	1 purple band, TH2 INCENDIARY.	None	Std-B	Incendiary	Bomb, grenade.
11	Thermite, TH1.....	TH1	1 purple band, TH1 INCENDIARY.	None	Std-A	Incendiary	Cryptographic equipment destroyers.

¹Std-A—standard-A, Std-B—standard-B.

²Mixture of magnesium and petroleum products

³Mixture of gasoline, synthetic rubber, magnesium, and other products.

⁴Thickened gasoline.

⁵Gasoline thickened with thickener, incendiary oil, M4.

⁶Gasoline thickened with thickener, incendiary oil, M1 (napalm).

⁷Gasoline thickened with thickener, incendiary oil, M2 (antiagglomerated napalm)

⁸Kerosene thickened with thickener, incendiary oil, M1 (napalm).

c. Data on Chemical-Filled Munitions.

1	2	3	4	5	6
Munition	Agent and weight of filling (lb)	Weight of filled projectile (lb)	Time for agent to burn or evaporate at point of release ¹	Marking and color	Chemical efficiency (percentage) ²
<i>Grenade</i>					
2 Grenade, hand and rifle, smoke, WP, M34.	WP—0.94	1.50	Aprx 1 min	WP smoke, 1 yellow band.	63
3 Grenade, hand, irritant, CN-DM, M6.	CN-DM—0.64	1.06	Aprx 1 min	CN-DM gas, 1 red band.	61
4 Grenade, hand, irritant, CN-DM, M6A1.	CN-DM—0.66	1.25	Aprx 1 min	CN-DM gas, 1 red band.	53
5 Grenade, hand, riot, CN, M25A1.	CN—0.20	0.47	Immediately	1 red band on container; none on grenade.	42
6 Grenade, hand, riot, CS1, M25A2.	CS1—0.20	0.46	Immediately	Bursting type, CS1, 1 red band.	44
7 Grenade, hand, smoke, WP, M15.	WP—0.95	1.93	Aprx 1 min	WP smoke, 1 yellow band.	47
8 Grenade, hand, tear, CN, M7-----	CN—0.64	1.06	Aprx 1 min	CN gas, 1 red band	61
9 Grenade, hand, tear, CN, M7A1--	CN—0.79	1.16	Aprx 1 min	CN gas, 1 red band	68
10 Grenade, hand, tear, CS, M7A1---	CS—0.61	1.03	15 to 35 sec	Burning type, CS, 1 red band.	60
11 Grenade, incendiary, TH3, AN-M14.	TH3—1.65	2.00	30 to 45 sec	TH incendiary, 1 purple band.	82
12 Grenade, rifle, smoke, WP, M19-A1.	WP—0.50	1.50	Aprx 1 min	WP smoke, 1 yellow band.	33
13 Grenade, rifle, smoke, M22 (4 colors). ³	Color—0.40	1.30	Aprx 1 min	1 yellow band (colors indicated).	30
14 Grenade, rifle, smoke, colored streamer, M23 (4 colors). ³	Color—0.40	0.90	Aprx 12 sec minimum.	1 yellow band (colors indicated).	44
15 Grenade, smoke, colored, M18 (4 colors). ³	Color—0.72	1.20	Aprx 1 min	1 yellow band; lettering and color of top indicate color of smoke.	60
16 Grenade, smoke, white, HC, AN-M8.	HC—1.20	1.60	2 to 3 min	HC smoke, 1 yellow band.	75
<i>Incendiaries</i>					
17 Cryptographic equipment destroyer, incendiary, TH1, M1A1.	TH1—28.00	32.00	Aprx 1 min	TH1, 1 purple band	88
18 Cryptographic equipment destroyer, incendiary, TH1, M1A2.	TH1—28.00	32.00	Aprx 1 min	TH1, 1 purple band	88
19 Cryptographic equipment destroyer, incendiary, TH1, M2A1.	TH1—8.50	11.50	Aprx 1 min	TH1, 1 purple band	74
20 Document destroyer, emergency, incendiary, M3.	Sodium nitrate—95.00.	----	20 sec	1 purple band on container; none on file destroyer.	--
21 File destroyer, incendiary, M4----	Sodium nitrate—73.00.	----	30 min	1 purple band on container; none on file destroyer.	--

See footnotes at end of table.

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	1	2	3	4	5	6
1	Munition	Agent and weight of filling (lb)	Weight of filled projectile (lb)	Time for agent to burn or evaporate at point of release ¹	Marking and color	Chemical efficiency (percentage) ²
	<i>Landmine</i>					
22	Mine, eml, 1-gal.....	HD—9.90	12.00	Aprx 15 sec	HD gas, 2 green bands	83
	<i>Smoke pot</i>					
23	Pot, smoke, ftg, HC, M4A2.....	HC—27.00	38.00	10 to 15 min	HC smoke, 1 yellow band.	71
24	Pot, smoke, HC, 10-lb, M1.....	HC—10.25	12.00	5 to 8 min	HC smoke, 1 yellow band.	84
25	Pot, smoke, HC, 30-lb, M5.....	HC—27.00	33.00	10 to 20 min	HC smoke, 1 yellow band.	81
26	Pot, smoke, ftg, SGF2, AN-M7..	Fog oil—13.00	37.00	12 to 17 min	1 yellow band	32
	<i>3.5-inch rocket</i>					
27	Rocket, smoke, 3.5-in., WP, M30..	WP—2.30	8.90	Immediately	WP smoke, 1 yellow band.	--
	<i>76-mm gun</i>					
28	Cartridge, 76-mm, smoke, WP, M312.	WP—0.73	12.95	Immediately	WP smoke, 1 yellow band.	6
29	Cartridge, 76-mm, smoke, WP, M361.	WP—0.73	12.95	Immediately	WP smoke, 1 yellow band.	5
	<i>81-mm mortar</i>					
30	Cartridge, 81-mm, smoke, WP, M57A1.	WP—4.06	12.30	Aprx 1 min	WP smoke, 1 yellow band.	33
31	Cartridge, 81-mm, smoke, FS, M57A1.	FS—4.59	12.18	Aprx 1 min	FS smoke, 1 yellow band.	37
	<i>90-mm gun</i>					
32	Cartridge, 90-mm, smoke, WP, M313.	WP—1.97	23.64	Immediately	WP smoke, 1 yellow band.	8
	<i>105-mm howitzer</i>					
33	Cartridge, 105-mm, smoke, BE, M84.	HC—4.96	32.86	2—5 min	HC smoke, 1 yellow band.	15
		Green—2.71	30.48	Aprx 1 min	1 yellow band (colors indicated).	9
		Violet—2.91	30.48	Aprx 1 min	----	Average
		Red—2.91	30.68	Aprx 1 min	----	----
		Yellow—2.51	30.28	Aprx 1 min	----	----
34	Cartridge, 105-mm, smoke, WP, M60.	WP—4.06	33.00	Immediately	WP smoke, 1 yellow band.	13
		FS—4.61	33.00	Immediately	FS smoke, 1 yellow band.	15

See footnotes at end of table.

1	2	3	4	5	6
Munition	Agent and weight of filling (lb)	Weight of filled projectile (lb)	Time for agent to burn or evaporate at point of release ¹	Marking and color	Chemical efficiency (percentage) ²
35 Cartridge, 105-mm, gas, H, M60-- <i>4.2-in. mortar, M2</i>	H—3.17	33.00	3 to 10 days	H gas, 2 green bands	10
36 Cartridge, 4.2-in., gas, M2-----	CNB—5.45	22.80	Several hours to 6 days.	CNB gas, 1 red band	23
	CNS—7.00	24.30	Several hours to 6 days.	CNS gas, 1 red band	28
	CG—6.25	23.55	5 to 10 min	CG gas, 1 green band	26
	CK—5.00	22.60	5 to 10 min	CK gas, 1 green band	21
	H—6.20	23.00	3 to 10 days	H gas, 2 green bands	26
	HD—6.00	23.50	3 to 10 days	HD gas, 2 green bands	25
	HT—5.75	22.60	Longer than H or HD.	HT gas, 2 green bands	28
37 Cartridge, 4.2-in., smoke, M2-----	WP—7.50	24.80	About 1 min	WP smoke, 1 yellow band.	30
	PWP—6.25	23.10	2 to 3 min	PWP smoke, 1 yellow band.	26
	FS—7.50	25.10	Immediately	FS smoke, 1 yellow band.	30
	FM—7.50	25.10	Immediately	FM smoke, 1 yellow band.	30
<i>155-mm howitzer</i>					
38 Projectile, 155-mm, smoke, M110.	WP—15.60	98.39	Immediately	WP smoke, 1 yellow band.	16
	FS—16.90	99.69	Immediately	FS smoke, 1 yellow band.	17
39 Projectile, 155-mm, smoke, BE, M116.	HC—25.84	94.35	About 2 min	HC smoke, 1 yellow band.	20
	Colored ³ —18.14	486.44	30 sec to 4 min.	1 yellow band (colors indicated).	20
40 Projectile, 155-mm, gas, CNS, M110.	CNS—13.80	494.49	Several hours to 6 days.	CN gas, 1 red band	14
41 Projectile, 155-mm, H, M110-----	H—11.70	494.49	3 to 10 days	H gas, 2 green bands	14
42 Projectile, 155-mm, gas, GB, M121.	GB—6.30	95.00	----	GB gas, 1 green band	--
<i>Fire starter</i>					
43 Starter, fire, NP3, M2-----	NP3 thickened kerosene—0.01	9.93	4 min	1 purple band; one end of fire starter is painted red.	33

¹Variable, depending on the amount of agent released, type of agent, terrain, and meteorological conditions.

²Ratio filling to total weight.

³Colors—red, yellow, green, and violet. For air-ground and other signaling.

⁴Estimated averages based on wide variations in zone weights.

d. Chemical Ammunition Requirements.

(1) Smoke shell.

(a) Rounds per 100 meters per minute for combined screening and casualty effects, using white phosphorus (WP).

	1	2	3	4	5
1	Wind direction	Follow- ing 6 o'clock	Head 12 o'clock	Flank 3 or 9 o'clock	Quar- ter- ing
2	81-mm mortar.....	2.75	2.20	1.10	2.20
3	4.2-inch mortar.....	1.37	1.10	5.50	1.10
4	105-mm howitzer....	9.90	7.70	1.60	6.60
5	155-mm howitzer....	3.30	2.20	0.55	2.20

(b) Rounds per 100 meters per minute for screening only. To obtain number of rounds required, measure line to be screened in 100-meter increments. Multiply the number of increments by the quantity shown for the direction of the wind; multiply by number of minutes screen is to be maintained. Fire twice the number of rounds indicated during the first minute to establish screen.

Rounds Per 100-meter Increments Per Minute^{1 2 3 4}

	1	2	3	4	5
1	Wind direction	6 or 12 o'clock		3 or 9 o'clock ⁵	
		WP	HC	WP	HC
2	81-mm mortar.....	1.65	-----	0.88	-----
3	4.2-inch mortar.....	0.77	-----	0.44	-----
4	105-mm howitzer....	4.40	3.30	1.60	0.28
5	155-mm howitzer....	1.40	3.30	0.55	0.28
6	Smoke pot, HC, M1 ⁶	-----	6.60	-----	3.30
7	Smoke pot, HC, 30- lb, M5 ⁶	-----	4.00	-----	1.00

¹ Table holds for winds up to 3 MPH

² For winds 3 MPH to 10 MPH, multiply results by 1.5.

³ For winds 10 MPH to 15 MPH, multiply results by 2.

⁴ Base ejection shell should be fired with mechanical time and super-quick fuze, M501, to give an airburst 1 to 2 seconds less than that used for zero height of burst.

⁵ Quantities are for smoke curtains up to 1,000 meters. For curtains of 1,000 to 1,200 meters, multiply values by 9; for curtains in excess of 1,200 meters, multiply values by 0.8.

⁶ For smoke pots, the quantities, indicated are the number of pots that must be kept burning. The M1 smoke pots burn an average of 7 minutes and the M5 pots burn an average of 15 minutes; hence, the indicated quantities will screen 100 meters for that period.

(2) Nerve agent (GB)—ammunition requirements (rounds) per hectare (100-meter square).¹

	1	2	3	4	5
1	Weapon	50 percent coverage of the target with an incapacitating dosage ²		50 percent coverage of the target with a lethal dosage ³	
		30-second attack ⁴	Total dose attack ⁵	30-second attack ⁴	Total dose attack ⁵
2	105-mm howitzer....	12.0	6.0	21.0	11.0
3	155-mm howitzer....	5.0	1.5	6.0	3.0
4	8-in. howitzer.....	2.0	2.0	4.0	3.0
5	4.5-in. rocket.....	6.0	3.0	10.0	5.0

¹ The meteorological conditions under which these calculations were made are neutral temperature gradient, wind speed of 8 MPH, and temperatures of 30° to 60° F. Different meteorological conditions will require recalculation of requirements (see TM 3-200)

² Dosage of 35 mg-min/m³

³ Dosage of 70 mg-min/m³.

⁴ To produce casualties among protected personnel through surprise in open terrain or sparse woods.

⁵ To produce casualties among unprotected personnel or as part of a planned attrition program

(3) Mustard (HD) ammunition for liquid contamination effect. Rounds per hectare for liquid contamination effect.

	1	2
1	Ammunition	Rounds per hectare (100-meter sq) ^{1 2}
2	4.2-inch mortar HD shell..	96
3	105-mm howitzer HD shell..	160
4	155-mm howitzer HD shell..	42

¹ To maintain liquid contamination hazard, mustard must be added periodically as mustard evaporates (see TM 3-200 for detailed calculations).

² The rounds per hectare required for vapor effect may be markedly lower, depending on meteorological conditions and time during which enemy personnel will be exposed (see TM 3-200 for detailed calculations)

(4) *Landmines, mustard (HD)*. Effect is obtained by contamination.

Mines Required

	1	2
1	Purpose	Mines required
2	Barriers.....	Ten parallel lines of mines 10 yards apart with mines staggered at 10-yard intervals in each line.
3	Large areas.....	40 mines uniformly spaced per 100 by 100 yard square.
4	Along roads.....	One line of mines on each side of the road with mines staggered at 10-yard intervals along each line.
5	Demolitions.....	Mines placed in lines 5 yards apart at 5-yard intervals along each line. The approaches to the demolition should be contaminated, using 40 mines per 100 by 100 yard square.

e. Chemical Landmine Operations (see also par. 4.32c).

	1	2	3	4	5	6
1	Nature of task	Squad task 1 truck (2½-ton)	Platoon task 4 squads	Company task 12 squads	Average time ¹	
					Time fuze or detonating cord	Wire for electric firing
2	Barrier (100 yd deep).....	300 yd wide 300 mines	1,300 yd wide 1,300 mines	5,000 yd wide 5,000 mines	4 hours	8 hours
3	Road contamination.....	1,600 yd 330 mines	6,400 yd 1,320 mines	19,200 yd 3,960 mines	15 to 20 minutes ²	2 hours

¹ The time should be increased 50 percent for night work.

² Detonating cord laid from truck; mines placed on cord.

Section V. SIGNAL COMMUNICATIONS

4.20. General

a. These data are intended for use as general guides only. The highly technical nature of signal operations and varying security measures require that these data be applied only as recommended by the unit signal officer after modification according to local field conditions and in the light of the tactical situation.

b. For signal troop requirements in a type field army, see paragraph 4.2e(12).

c. For signal troop requirements in airborne operations, see paragraph 4.4; in the theater

army logistical command, see paragraph 4.3; and in amphibious operations, see paragraph 4.5.

d. For signal construction factors, see paragraph 8.13.

e. For characteristics of target acquisition and combat surveillance equipment, see FM 101-10, part III, paragraph 4.10.

f. Publications Governing Signal Communications.

- (1) Pertinent sections of the unit SOP set forth the general principles under which the unit signal system will

operate. Usually the SOP is governed by the provisions of that of the next higher headquarters and, in turn, serves as a guide for that of subordinate headquarters.

- (2) Standing signal instructions (SSI) are prepared by the unit signal officer and published by the command to provide permanent direction for the use of technical items of signal operation instructions (SOI).
- (3) SOI contain the specific technical directions for the operation of the various means of signal communication. They include separate items providing such information as telephone directory code names and numbers, radio call signs and frequencies, unit code and ciphers, and pyrotechnic signals. Because changes in items of SOI occur frequently, paragraph 5 of the field order specifies the current index.
- (4) Joint Army-Navy-Air Force Publications (JANAP) and Allied Communications Publications (ACP) contain joint and combined instructions, methods, and procedures pertaining to communication planning and operations.

4.21. Users Served by the Signal Communication System

The military signal communication system in a theater of operations provides service for the following:

a. Signal Communications in the Combat Zone.

- (1) Division.
- (2) Corps.
- (3) Field army.

b. Signal Communications in the Communications Zone.

- (1) Army group.
- (2) Base and advance sections; area commands; depots and ports.

c. Communication Facilities as Required for—

- (1) Air defense.

- (2) Coordination of Army and Air Force activities, including facilities for the request of air support.
- (3) Coordination of Army and Navy activities.
- (4) Operation of military railways and pipelines.
- (5) Military police activities, including traffic control.
- (6) Personnel replacement systems.
- (7) Intelligence and counterintelligence activities.
- (8) Civil affairs.
- (9) Psychological warfare activities.
- (10) Press, public relations, and special services activities.
- (11) Guided missile installations and activities.
- (12) Clandestine and guerrilla warfare.
- (13) Interallied signal communication.
- (14) Electronic warfare.
- (15) Meteorological service.
- (16) Signal security activities.
- (17) Air traffic control.
- (18) Air navigation systems.
- (19) Identification, friend or foe, systems.
- (20) Automatic data processing systems.
- (21) Military highway communications.
- (22) POL supply.

4.22. Command Posts and the Area-Type Signal Communication System

a. The Area-Type Signal Communication System. The area-type signal communication system, with its multiaxes configuration, provides the field army, corps, and division units with signal center installations through which they can establish a call to any point in the field army area. The system is supplied primarily by six combat area signal battalions (army) at field army level and by the signal battalion associated with each division. Essentially, the system is composed of radio-relay links for long lines of communication, the standard wire installations for internal command post communications, and local wire installations to connect subordinate and supporting units to the signal center. The area-type system divides the geographical area of a command into smaller areas

(not necessarily equal in size) of relatively equal communication load. Communication facilities are supplied at each signal center installation to enable the movement of command posts from one location to another without disruption of the overall system. The signal center installation provides the maximum number of alternate routes for message handling to reduce probability of interruption of communications between major units. Initial long-line connections between major headquarters at all levels will be radio relay; as the situation and equipment availability permit, these circuits may be replaced by a more secure wire system.

b. Command Posts. Each major headquarters installation at field army, corps, and division level is furnished sufficient signal personnel and equipment to install, operate, and maintain a complete command post communication system. The time required to install the system will vary with the situation and size of the headquarters. Command and staff signal communication facilities will, in most cases, be immediately available in the alternate signal center installations previously installed to provide the initial area-type signal communication system.

c. Movement. Military operations on the nuclear battlefield will require frequent command post displacements. The facilities required to provide signal communications to the command should be responsive to the command; i.e., they must have a high degree of flexibility. This is accomplished through the multiaxes configuration used in the signal communication system. Because movement causes a temporary partial reduction of the overall signal communication system, movement of major headquarters should be as infrequent as the situation will permit. When it is necessary for the commander to establish a headquarters close to the front in a rapidly moving situation, facilities as required are made available to provide the necessary communications for the commander's group.

4.23. Communication Center

a. Function. The function of the communication center is to transmit, receive, and deliver

messages by the most reliable means. The figures in this paragraph and in paragraph 4.24 apply to communication center operations and are based on World War II experience. Under present and future concepts of operations, the accuracy of these figures may vary widely.

b. Cryptographic Operations. Computed from afteraction reports of selected units in the ETO during World War II, and including messages sent by radio, teletypewriter, and miscellaneous means.

1		Division	Corps	Field army	Army groups
2	Average code groups per month---	225,000	500,000	750,000	1,800,000

c. Precedence. The nomenclature for classes of precedence in the following table, compiled from afteraction reports in the ETO during World War II, has been changed to conform to present usage.

1		Flash	Emergency	Operational immediate	Priority	Routine	Deferred
2	Percentage of all messages (field army HQ).	Negligible.	8%	30%	23%	39%	Negligible.

d. Speed of Transmission. Computed to allow for operational signaling; repeating garbled groups, including address and signatures; and receipting.

1	Means of transmission	Words per hour
2	Radiotelephone-----	80-120
3	Facsimile-----	100
4	Telephone-----	100-150
5	Panel (code groups per hour)-----	15
6	Radiotelegraph-----	150-250
7	Teletypewriter (single line)-----	500-800
8	Teletypewriter (duplex)	1,000-1,500

4.24. Means of Signal Communication

a. General.

(1) *Military messages are transmitted by—*

- (a) Messenger, including scheduled and special foot, motor, and airplane messengers and officer couriers.
- (b) Wire circuits, including telephone, teletypewriter, and facsimile.
- (c) Visual, including flags, panels, lamps, and pyrotechnics.
- (d) Sound, including whistles, horns, loudspeaker systems, and small-arms fire.
- (e) Radio circuits, including teletypewriter, voice, CW, facsimile, and data and special transmissions.
- (f) Ancillary devices, such as data processing and transmission facilities and special communication devices.

(2) *Use of means of signal communication.* Messenger, wire, radio, and radio relay are used for communication within and between division, corps,

field army, and higher headquarters. In addition to these means, visual and sound systems are used in air-ground signaling, in amphibious operations, for emergency communication within small units, and as warning signals.

b. Radio.

(1) *General.* The amount of traffic that is handled by radio—exclusive of messages handled via radio-relay equipment installed as part or in lieu of the wire net—depends on the type of unit and the rate of movement. In general, radio forms a standby means of communication during static conditions when its operation would provide information to enemy intercept and analysis; but in fast-moving situations when it is difficult to extend wire lines rapidly enough and when units disperse on a wide front, radio becomes a major means of communication.

(2) *Radio traffic of selected units in the ETO during World War II.*

1		Armored division	Infantry division	Corps	Field army	Army group
2	Average messages per month.....	2,400	200	500	9,500	3,800
3	Average code groups or words per month.....		35,000	85,000	163,000	650,000

c. *Television.* Military television is currently limited to noncombat applications in CONUS and the communications zone; e.g., training, conferences, etc.

d. Wire.

(1) *General.* Wire communication networks generally provide a more secure means of electrical transmission of messages than does radio. Relative security depends on geographic location of the net, the tactical situation, local security measures, the type of equipment being used, and the type of conductor employed in the line. The transmission of classified messages in the clear over these circuits will be resorted to only when the urgency of

the tactical situation outweighs the security requirements.

(2) *Telephone.* Each headquarters has enough telephone facilities to satisfy normal operating requirements, providing that proper use is made of written messages for traffic not adapted to telephonic transmission. During World War II, unit switchboards in the ETO handled the following average of calls:

1		Division	Corps	Field army	Army group
2	Calls per day....	2,000	5,000	12,500	18,000

- (3) *Teletypewriter.* The following table shows the average number of teletypewriter messages handled by various types of headquarters in the ETO during World War II.

1		Division	Corps	Field army	Army group
2	Messages per month.	750	4,000	11,500	28,000

- (4) *Construction.* For figures on permanent and semipermanent wire construction, see paragraph 8.13.

(a) *Rates of wire line construction.*

1		Foot troops	Reel trucks	Signal construction battalion
2	Field wire---	1½ MPH/ 3-man team.	3-5 MPH/ 6-man team.	----
3	Spiral-4 cable (on existing support).	----	1 MPH/8-man team.	----
4	Open wire (10-wire pole line).	----	----	30 miles per week.

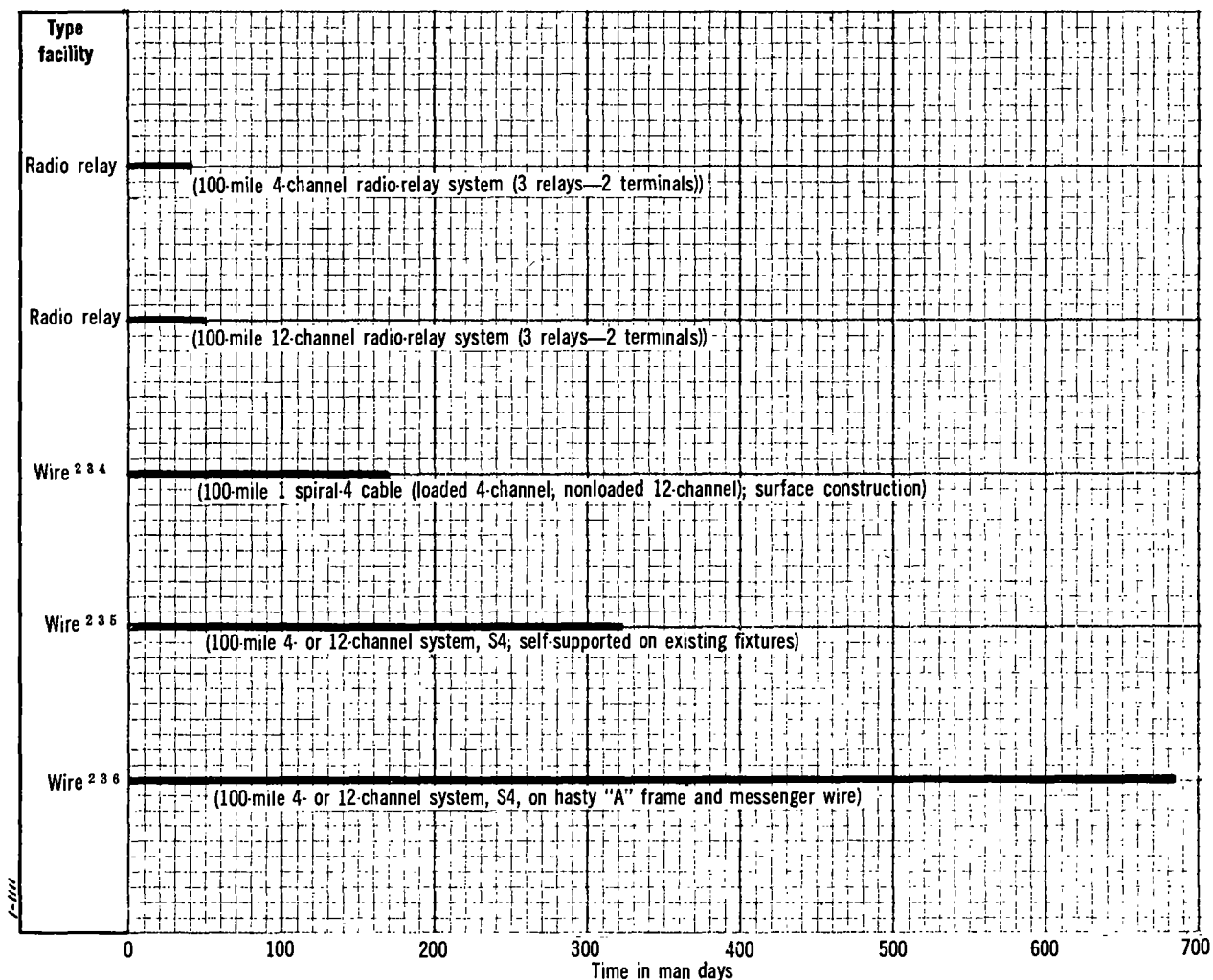
- (b) *Spiral-4 cable, field wire, and open wire laid to next subordinate headquarters by selected units during World War II in the ETO.*

1	Miles per month of—	Division	Corps	Field army
2	Field Wire-----	450	-----	-----
3	Cable and field wire-----	-----	700	1,300
4	Open wire-----	-----	-----	500

- (c) *Average rate of repair of wire lines over a 6-month period during World War II in the ETO by a well-trained division signal company.*

1		Daylight	Night	Average time out day and night
2	Elapsed time in minutes	70	120	95

e. Comparison Between Radio-Relay and Wire Circuit Installation Time.¹



¹Time includes site survey and selection, travel time, equipment and antenna installation, assuming that all sites are accessible to vehicles.

²Signal cable construction company, TOE 11-47D; total strength 267.

³Combat conditions: 12-hour day, figuring loss loading, travel, supply, and vehicle maintenance.

⁴Based on sustained capability of 5 miles per 8-man team per day.

⁵Based on sustained capability of 2.63 miles per 8-man team per day.

⁶Based on sustained capability of 1.25 miles per 8-man team per day.

f. Messenger.

- (1) The rate of travel of various types of messenger is listed below, no consideration being given to traffic restrictions, climate, or weather.

1	Kind of messenger	Rate of travel in miles per hour	
		Day	Night
2	Dismounted (runner).....	3-5	2-4
3	Motor.....	25-40	15-30
	Aircraft:		
4	Fixed-wing.....	90-160	90-160
5	Rotary-wing.....	60-100	60-100

- (2) Each headquarters is furnished organic messenger facilities. The bulk of messenger traffic is carried by motor messenger. The capabilities of motor messenger service available to units are indicated below.

1		Division	Corps	Field army
2	Miles of route per month..	7,000	30,000	90,000
3	Pouches and messages...	17,000	50,000	150,000

- (3) The quantity of messages that can be transmitted by messenger and the speed of transmission are increased when messages are accounted for in the communication center by pouch rather than by individual message.

4.25. Special Communication Requirements

a. General. Certain intersectional services require special communication facilities. Whenever possible, these requirements are integrated into the theater army signal communication system. Special requirements of these services are presented in the following subparagraphs.

b. Military Railway Service Communication Data. A military railway service (MRS) communication system normally consists of open-wire facilities. As an *ultimate* oversea necessity, VHF radio and VHF/UHF radio relay may be required.

- (1) Two metallic pairs are required to provide the telephone and teletypewriter circuits needed. Open-wire leads may or may not closely follow the railway, but circuits must be available at each way station and dispatcher's office.
- (2) Associated equipment with open-wire lines usually consists of telephone dispatching equipment, simplex and composite sets, telephone and telegraph voice-frequency repeaters, and may include use of telephone carrier facilities.
- (3) VHF radio may be used in railroad yard areas for yard-to-engine operation.
- (4) VHF/UHF radio relay may be used between adjacent division dispatcher's offices and from division dispatcher to way stations where wire lines experience frequent outages because of hostile action and where backup communications are required. It is valuable also during operations requiring speed of installation.
- (5) Circuit requirements—
 - (a) Dispatcher to way stations.
 - (b) Way station to way station.
 - (c) Dispatcher to dispatcher.
 1. Telephone.
 2. Teletypewriter.
 - (d) Division headquarters to MRS headquarters.
 1. Telephone.
 2. Teletypewriter.

c. Military Pipeline Communication Data.

- (1) Military pipeline communication may be provided on allocated channels of the theater army signal communication system. In geographical areas where it is not feasible to utilize this system, a separate radio-relay system will be installed and, when practicable, it will be integrated with the theater army signal communication system.
- (2) VHF radio facilities are provided at each pumping station, tank farm complex, and district dispatcher's office

for communication to aerial and ground mobile units. This equipment further provides emergency communication between these elements.

- (3) High-frequency radio facilities are provided for emergency communication between the chief dispatching station and each district dispatcher.
- (4) Equipment associated with the system consists of telephone dispatching systems, teletypewriter sets, simplex and composite sets, telephone and telegraph voice-frequency repeaters, and may include telephone carrier systems.
- (5) For planning purposes, it is estimated that approximately 65 percent of the total pipeline communication circuit requirements in an overseas theater will be provided from the theater army signal communication system. This estimate is based on the assumption that the pipelines and the axes of the theater army signal communication system will generally coincide. The remaining 35 percent by the pipeline communication circuit requirements will be provided by the Signal Corps as separate construction to support the POL system.

d. Military Highway Communication Data.

- (1) A military highway communication system usually consists of fixed VHF radio stations, with the stations located at strategic intervals of approximately 40 or 50 miles. These stations may be situated adjacent to the traffic control posts (TCP) and highway regulating points or may be situated at the same location. The fixed radio stations are connected to the nearest theater army signal switching center in order to provide access to the integrated theater army communication system. This connection also enables the strategically located highway radio stations, TCP's, and highway regulating points to communicate with each other and also

to communicate with ports, depots, headquarters, and other areas.

- (2) The fixed VHF radio stations enable the radio-equipped vehicles, normally military police and some transportation or ordnance vehicles, to communicate with the nearest TCP and highway regulating point while moving or stopped. All such radio contact depends on the terrain, location of fixed and vehicular radio sets, and other factors affecting radio transmission.
- (3) In addition to radiotelephone communication between fixed and vehicular radio stations, telephone and teletypewriter circuits are provided via the open-wire or radio-relay facilities between the fixed radio stations serving the TCP's and the highway regulating points.
- (4) The fixed radio stations are operated by the Signal Corps in order to provide maximum economy of equipment, radio frequencies, speed of service, and efficiency to the various services and units requiring communications along the military highway system. At each fixed radio station, a small switchboard, when required, is also operated by the Signal Corps, with local telephone connections to the various adjacent services operating the TCP's and the highway regulating points. In some instances, the fixed radio station will be located at or near a theater army signal switching center or a local signal center and will use its switchboard facilities.

4.26. Signal Pictorial Services

a. General. Still and motion picture photography, photo laboratory processing, film and equipment exchange, and television services are utilized at division, corps, field army, and theater levels. Facilities to provide these various services are available in differing degrees, commensurate with the pictorial requirements at these levels of command. The pictorial facilities at division are used almost exclusively for

tactical purposes, while at corps and above they are used more extensively for historical record, administrative purposes, training, and information. However, each level of command is responsible for the provision of pictorial support to its subordinate units; when such sup-

port is for tactical purposes, requests from subordinate units are given priority consideration.

b. *Pictorial Capabilities.* The following chart shows the pictorial facilities of the Army in the field:

	1	2	3	4	5	6	7	8	9
	Unit	Pictorial personnel	Ground cameras	Aerial cameras	Motion picture cameras	TV equipment	Still photo lab	Motion picture lab	Film and equipment exchanges
1	HQ & HQ co, sig bn, inf div TOE 11-6D.	Off 1 EM 9	X		X		X	Service from theater.	
2	Avn co, inf div TOE 1-7D.	Off 6 EM 4		X			Service from sig bn, inf div.		
3	Avn co, abn div TOE 1-57D.	EM 2		X			X		
4	HQ & HQ co, sig bn, armd div TOE 11-56D.	Off 1 EM 11	X		X		X	Service from theater.	
5	Avn co, armd div TOE 1-17D.	Off 6 EM 4		X			Service from sig bn, armd div.		
6	HQ & HQ co, armd div (info sec) TOE 17-2D.	EM 1	X				Service from sig bn, armd div.		
7	HQ & HQ co, corps sig bn or sig bn, abn corps TOE 11-16D.	Off 1 EM 15	X		X		X	Service from theater.	
8	HQ & HQ co, army sig bn TOE 11-96D.	Off 4 EM 40	X	X	X		X	Service from theater.	
9	Sig air photo repro and dlvr co (fld army) TOE 11-54D.	Off 4 EM 58	This company has special semiautomatic laboratory equipment for Army reproduction of Air Force aerial photographs.						

	1	2	3	4	5	6	7	8	9
1	Unit	Pictorial personnel	Ground cameras	Aerial cameras	Motion picture cameras	TV equipment	Still photo lab	Motion picture lab	Film and equipment exchanges
11	Sig pictorial bn TOE 11-() P.	Off 73 WO 23 EM 699	X	X	X	X	X	X	X

4.27. Characteristics of Signal Equipment

For detailed technical characteristics of signal equipment, see appropriate TM's.

a. Wire and Cable.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	Axle, RL-27D-----	Portable wire-laying unit carried by two men.	NA-----	Pays out and recovers 1 mile field wire, WD-1/TT, from reel, RL-159/U. Employed at company level and above.
3	Cable, CX-162/G-----	5-pair voice-frequency field telephone cable.	24 mi-----	Furnished in 100-, 300-, 500- and 1,000-foot lengths. Employed throughout division, corps, and field army.
4	Cable, CX-1065/G-----	2-pair field carrier cable assembly.	NA-----	Spiral-4 cable furnished in ¼-mile lengths. Employed throughout division, corps, and field army.
5	Central office, telephone manual, AN/TTC-7.	Complete transportable telephone central office.	NA-----	Capable of terminating 200 lines common or local battery and 40 trunk circuits. Expandable to a capacity of 1,000 lines, common or local battery, and 160 trunk circuits by adding components and positions of additional AN/TTC-7's. Employed at corps and field army levels.
6	Communication operations center, AN/MSC-25.	A mobile signal operations office with facilities for planning, engineering, and controlling field army communication systems.	NA-----	Installed in V-51 semitrailer. Employed at field army level.
7	Communication operations center, AN/MSC-31.	A mobile signal operations office with facilities for planning, engineering, and controlling an area-type signal communication system.	NA-----	Installed in S-141 shelter. Used at division, corps, and field army levels.
8	Communication patching panel, SB-611/MRC.	Flexible, mobile circuit-controlling unit capable of terminating 624 circuits. Testing and monitoring facilities are integral.	NA-----	Employed at battle group and division levels.

1	2	3	4
Nomenclature	Description	Range	Remarks
9 Communication patching panel, SB-675/MS.	Versatile, mobile circuit-controlling unit capable of terminating and interconnecting 900 circuits. Testing and monitoring facilities for voice and teletypewriter circuits are integral.	NA.....	Employed at corps and field army levels.
10 Emergency switchboard, SB-992/GT.	Lightweight, portable emergency switching equipment for local battery telephone lines.	NA.....	Six-line capacity. Employed at company level.
11 Manual telephone central office, AN/MTC-1.	Mobile central office capable of interconnecting 180 local battery telephone lines and 20 trunk circuits.	NA.....	Employed at corps and field army levels.
12 Manual telephone central office, AN/MTC-3.	Mobile central office capable of interconnecting 120 local battery telephone lines.	NA.....	Employed at division level.
13 Manual telephone central office, AN/MTC-7.	Mobile central office capable of interconnecting 60 local battery telephone lines.	NA.....	Employed at battle group level.
14 Manual telephone central office, AN/MTC-8.	Mobile central office capable of interconnecting 540 local battery and 60 trunk telephone lines.	NA.....	Installed in V-51 semitrailer. Used in conjunction with telephone connecting and switching group, AN/MTA-5. Employed at field army level.
15 Operations central, AN/MS-32.	Mobile operations central with complete facilities for planning, engineering, and controlling an area-type signal communication system of a corps or larger organization.	NA.....	Used in conjunction with communication operations center, AN/MS-31, by corps and field army.
16 Reel equipment, CE-11....	Portable wire-laying unit carried by one man.	NA.....	Consists of reel unit, RL-39, and sound-powered telephone, TA-1/PT. Employed at company level.
17 Reel unit, RL-26E.....	Gasoline-driven, two-axle unit for payout and recovery of field wire and cable.	NA.....	Payout of wire and cable at speeds up to 30 MPH. Employed within division, corps, field army, communications zone, and CONUS.
18 Reel unit, RL-31E.....	A-frame with divided axle. Manual operation.	NA.....	Can be vehicular mounted. Employed throughout division.
19 Remote control, AN/GSA-7.	Remote control unit to interconnect radio circuits with local battery telephones on a DC push-to-talk basis.	NA.....	Employed throughout division, corps, and field army.
20 Switchboard, telephone, SB-22/PT.	Portable switching equipment for local battery lines, teletypewriter, and remote control radio communications.	NA.....	12-line capacity. Employed at company, battle group, and regiment levels.
21 Switchboard, telephone, SB-86/P.	Provides for interconnection of 30 lines. Has a capacity of 60 lines with the addition of a switchboard signal assembly. Provides magnetophone lines, com-	NA.....	Employed throughout division.

1	1	2	3	4
	Nomenclature	Description	Range	Remarks
		mon battery trunks to manual civilian exchange, and common battery supervision.		
22	Telegraph-telephone terminal, AN/MCC-6.	Mobile carrier frequency telephone-telegraph terminal capable of providing 24 channels of carrier telephone or 22 channels of carrier telephone plus 16 channels of carrier telegraph over spiral-4 or wide-band radio circuits.	NA.....	Employed at corps and field army levels.
23	Telegraph terminal, AN/MCC-11.	Mobile carrier teletypewriter terminal capable of utilizing two telephone channels to provide eight full-duplex teletypewriter channels.	NA.....	Employed at corps and field army levels.
24	Telegraph terminal, AN/MS-29.	Mobile teletypewriter operations unit having facilities for four duplex or eight half-duplex voice-frequency teletypewriter circuits. Provision is also made for on-line and off-line cryptographic facilities.	NA.....	Employed at division, corps and field army levels.
25	Telephone, TA-1/PT.....	Field-type sound powered.....	5 mi.....	A sound-powered telephone intended for use on field wire lines to provide visible and audible signals. Employed in forward areas and at company level with field telephones or local battery switchboards.
26	Telephone, TA-236/FT...	A fixed-station telephone desk set designed for common battery operation.	NA.....	Similar to commercial telephone desk set. Employed at corps, field army, and theater army logistical command levels.
27	Telephone, TA-264/PT...	A portable amplifier telephone set designed to provide communications over greater distances than those obtained with conventional local battery telephone sets.	NA.....	Employed at division, corps, and field army levels.
28	Telephone, TA-312/PT...	A rugged lightweight, waterproof telephone set designed for local or common battery operation.	NA.....	Employed throughout division.
29	Telephone repeater, AN/MCC-3.	Mobile attended 12-channel telephone carrier repeater used to extend range of wire carrier system using nonloaded spiral-4 cable.	NA.....	Employed at division, corps, and field army levels.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
30	Telephone terminal, AN/- MCC-9.	Mobile carrier telephone terminal capable of providing eight telephone channels. Two half-duplex or one full-duplex teletypewriter channels may be superimposed on a speech-plus-duplex basis.	NA.....	Employed at corps level.
31	Teletypewriter, AN/- PGC-1.	Lightweight send-recvie page printer.	NA.....	Employed at division, corps, and field army levels.
32	Teletypewriter, AN/- FGC-20.	Page-printing teletypewriter set used to transmit, monitor, and receive messages in fixed-plant stations and communication centers.	NA.....	Employed in theater army logistical command signal system.
33	Teletypewriter, AN/- GGC-3.	Portable send-recvie typing reperformator and tape transmitter.	NA.....	Employed in division, corps and field army.
34	Teletypewriter central office, AN/MGC-9.	Mobile central office capable of terminating and interconnecting 120 voice-frequency teletypewriter circuits.	NA.....	Employed at corps level.
35	Teletypewriter central office, AN/MGC-17.	Mobile switching central capable of interconnecting 32 voice-frequency teletypewriter circuits on local telephone lines.	NA.....	Employed at battle group, division, and corps levels.
36	Teletypewriter central office, AN/MGC-19.	Mobile tape relay teletypewriter facility providing eight full-duplex or 16 half-duplex circuits employing either DC or voice-frequency keying.	NA.....	Employed at corps and field army levels.
37	Terminal, telephone, AN/TCC-4.	A lightweight, portable, tactical telegraph terminal which will provide 8 full-duplex teletypewriter channels over one 4 kc telephone channel on a 2- or 4-wire basis.	NA.....	Employed at division, corps, field army, and theater army logistical command levels.
38	Terminal, telegraph, AN/TCC-14.	Speech-plus-duplex terminal to provide simultaneous telephone and teletypewriter service over conventional telephone circuit.	NA.....	Employed at battle group, division, corps, and field army levels.
39	Wire, WD-1/TT, on reel, RL-159/U.	Field telephone wire.....	24 mi.....	Twisted pair employed throughout division, corps, and field army.
40	Wire, WD-1/TT, in dispenser, MX-306 A/G.	1/2-mile field wire in lightweight, expendable, fabric cannister.	NA.....	Wire may be paid out from man pack, ground, vehicle, or aircraft. Wire can be projected by rocket or rifle grenade. Employed at company, battle group, and regiment levels.

b. Television.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	Model A-2.....	Lightweight airborne TV system for reconnaissance and aerial observation.	NA.....	May be employed at battle group level, etc.

c. Radio and Radio Relay.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	AN/GRC-3 }—Armor.... AN/GRC-4 } AN/GRC-5 }—Artillery.. AN/GRC-6 } AN/GRC-7 }—Infantry.. AN/GRC-8 }	Vehicular, frequency-modulated radio sets that provide short-range radiotelephone facilities within the frequency range of 20 to 58.4 mc. Short range for tank and command vehicle communication.	15 mi stationary; 10 mi moving.	Employed within and between armored, artillery, and infantry units.
3	AN/VRC-8—Armor..... AN/VRC-9—Artillery.... AN/VRC-10—Infantry....	Same set as AN/GRC-4, 6, 8, except interphone and retransmission facilities not provided.	15 mi stationary; 10 mi moving.	Usually provided for open vehicles. Employed throughout division.
4	AN/VRQ-1—Armor..... AN/VRQ-2—Artillery.... AN/VRQ-3—Infantry....	Basically consists of 2 AN/VRC-8, 9, or 10 sets on a single mounting.	15 mi stationary; 10 mi moving.	Used for radio-relay purposes to extend operating range.
5	AN/PRC-8—Armor..... AN/PRC-9—Artillery.... AN/PRC-10—Infantry....	Man-packed portable, frequency-modulated radio sets intended to provide radio-telephone communications within and between armored, artillery, and infantry units.	3 to 5 mi.....	Can be operated as man-packed, portable, vehicular, aircraft, or ground installation. Employed at company, battle group, and division levels.
6	AN/PRC-6.....	Portable, short-range battery-operated radio-receiver-transmitter.	1 mi.....	Employed by company and battle group.
7	AN/ARC-44.....	Set installed in Army aircraft for communication with the AN/GRC-3 through 8 series.	Line of sight.....	Employed throughout division, corps, and field army.
8	AN/GRC-10.....	Portable radio-relay set; used in conjunction with tactical wire carrier equipment to provide multichannel telephone, teletypewriter, or facsimile service or used independently to provide a single communication channel.	25 mi (line of sight) ..	Employed throughout airborne divisions and missile commands by signal personnel.
9	AN/TRC-24.....	A high-quality radio-relay set, designed to operate with telephone carrier equipment to provide 12 telephone, teletypewriter, or facsimile channels, or a combination of these channels.	Up to 50 mi (line of sight) per jump and 200 mi per radio-relay system.	Employed at battle group, division, corps, and field army levels.

	1	2	3	4
	Nomenclature	Description	Range	Remarks
10	AN/MRC-68.....	Mobile 4-channel radio-relay station; principal components include 1 radio set, AN/GRC-40; 2 telephone terminals, AN/TCC-3; converter; and a trailer-mounted generator set.	40 mi.....	Employed throughout airborne divisions and missile commands by signal personnel.
11	AN/MRC-69.....	Mobile 12-channel radio-relay station; principal components include radio set, AN/TRC-35; telephone terminal, AN/TCC-7; converters; filter assemblies; and a trailer-mounted generator set.	Up to 50 mi (line of sight).	Employed at battle group and division levels.
12	AN/GRR-5.....	Portable or vehicle-mounted utility, AM radio-receiver, providing reception of voice, CW, and MCW signals within the frequency range of 1.5 to 18 mc.	NA.....	Employed through division, corps, and field army.
13	AN/GRC-19.....	A 100-watt vehicle radio set, providing AM voice, CW, and frequency shift keying facilities within the frequency range of 1.5 to 20 mc.	Ground-wave-50 mi; sky-wave-150 to 1,500 mi.	Employed at division, corps, and field army levels.
14	AN/GRC-46.....	A vehicular AM radio set mounted in a shelter, S-89/G; provides voice, CW, or frequency shift radioteletypewriter operation over a transmission frequency of 1.5 to 20 mc and a reception frequency range of 0.5 to 32 mc.	Ground-wave-50 mi; sky-wave-up to 1,000 mi.	Employed throughout division.
15	AN/VRC-29.....	Same set as AN/GRC-46 without shelter.	50 mi.....	Employed at division, corps, and field army levels.
16	AN/GRC-26.....	A mobile AM radio set with facilities for frequency shift transmission and reception of radioteletypewriter signals on a frequency range of 2 to 8 mc; full-duplex, half-duplex, or one-way reversible operation. Voice transmission may be used alone and simultaneously in voice and teletypewriter operation.	RATT-250 mi; voice-100 mi. Extended ranges with doublet antenna.	Employed throughout division, corps, and field army.
17	AN/MRC-54.....	Complete mobile radio-relay repeater. Used in conjunction with AN/MRC-69 as a repeater or with an AN/TCC-7 as a terminal. Basically consists of three AN/TRC-24's.	50 mi.....	Employed throughout area-type signal communication system by signal battalion personnel.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
18	AN/MRC-73-----	Mobile 12-channel radio-relay station; principal components include radio set, AN/TRC-24; telephone terminal, AN/-TCC-7; converters; filter assemblies; and a trailer-mounted generator set.	Up to 50 mi (line of sight).	Employed at corps and field army levels.
19	AN/MRR-8-()-----	Radio-receiving central. Provides 8 high-frequency radio-receiving circuits in the frequency range of 0.5 to 32 mc. Operates in conjunction with radio-transmitting central, AN/MRT-9. Equipment is installed in shelter, S-141.	Limited only by the signal transmitted. (See AN/MRT-9.)	Employed at field army level.
20	AN/MRT-9-()-----	Radio-transmitting central providing four 500-watt dual-diversity high-frequency circuits in the frequency range of 1.5 to 20 mc. Operates in conjunction with radio-receiving central, AN/MRR-8. Equipment is installed in shelter, S-141.	RATT-250 mi; voice-100 mi. Extended range with doublet antenna.	Employed at field army level.
21	AN/VRC-24-----	Vehicular, amplitude-modulated radio set that provides radio-telephone facilities within the frequency range of 228 to 399.9 mc. Used in air-ground communications.	30 mi at 1,000-foot air elevation.	Employed at battle group, division, corps, and field army levels.

d. Photographic.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	KS-10 (ground)-----	16-mm motion picture camera	NA-----	Employed at division, corps, and field army levels.
3	KA-20(1) (air)-----	Day aerial camera, taking general-purpose (vertical and oblique) photos. Camera has 6" lens and produces 9" x 9" negative. Image motion compensation adjustable to altitudes of 600, 1,000, and 1,500 feet only.	NA-----	Employed at division and corps levels. Can be used in drones or L-19 aircraft.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
4	KA-30 (air)-----	A compact, day/night general-purpose aerial reconnaissance camera; especially suited for low-altitude, high-speed photography. Camera has interchangeable (3", 6", 12", and 18") lens cones and produces a 4½" x 4½" negative.	NA-----	Employed at division, corps, and field army levels. Can be used in a variety of aircraft and drones, SID-2 and 3.
5	KS-39-A (air)-----	Day/night aerial camera for taking general-purpose (vertical and oblique) photos. Camera has 6" lens and produces a 9" x 9" negative. Image motion compensation adjustable to altitudes of 600, 1,000, and 1,500 feet only.	NA-----	Employed at division, corps, U.S. Army missile command (air-transportable and medium), and armored cavalry regiment levels. Can be used in L-19 and L-20 aircraft and SID-1 drone.
6	KS-4 (ground)-----	Hand-held utility camera, 4" x 5" format.	NA-----	Employed at division, corps, and field army levels.
7	KS-5 (ground)-----	35-mm motion picture camera.	NA-----	Employed at division, corps, and field army levels.
8	KS-6 (ground)-----	Hand-held utility camera, 70-mm format.	NA-----	Employed at battle group, regiment, division, corps, and field army levels.
9	AN/TFQ-7-----	Complete photographic laboratory darkroom for processing still and aerial negatives in widths from 35-mm to 9½". Mobile when mounted on 2½-ton truck.	NA-----	Employed at division, corps, and field army levels.

e. Facsimile Equipment.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	RC-120-----	Transmits and receives pictures, maps, or messages in sizes up to 7" x 8⅝" over a radio or wire voice communication channel.	NA-----	Requires one voice circuit. Transmission time—7½ minutes per page. Employed at division, corps, and field army levels.
3	AN/TXC-1-----	Transmits or receives pictures, maps, or messages in sizes up to 12" x 18⅛".	NA-----	Requires one voice circuit. Transmission time—20 minutes per page. Employed at division, corps, and field army levels.

f. Public Address Equipment.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	AN/PIQ-1.....	Pack-carried public address set for instruction and training.	600 ft.	Indoor, outdoor, and mobile operation.
3	AN/TIQ-2.....	General-purpose PA system for large audiences.	NA.....	
4	AN/TIQ-3.....	Outdoor intercommunication and PA for widely dispersed areas.	500 yd.	
5	AN/TIP-2.....	High-power PA system for noisy area.	2,500 yd.	

g. Combat Surveillance.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
2	Ground radar surveillance set, AN/PPS-4.	Portable forward area radar surveillance equipment, used to locate and identify moving targets.	-----	Employed at company level.
3	Ground radar surveillance set, AN/TPS-21.	Vehicular portable forward area radar surveillance equipment, used to locate and identify moving targets.	-----	Employed at battle group level.
4	Ground radar surveillance set, AN/TPS-25.	Vehicular portable forward area radar surveillance equipment, used to locate and identify moving targets.	-----	Employed at division, missile command, and lower levels.
5	Surveillance drone systems (AN/USD-1 and succeeding items).	Unmanned, airborne forward area surveillance system.	-----	Employed at field army and lower levels; systems currently mount KA-20(1) aerial camera. Improved cameras as well as other sensors, data links, navigational equipment, IFF and beacon equipment will be mounted as developed.
6	Ground control radar system, AN/MPQ-29, and succeeding items.	Vehicular-mounted drone surveillance radar control system.	-----	Employed with both manned aircraft and surveillance drones as positioning and locating equipment; systems include associated display, command control, and communication equipment.
7	Airborne surveillance radar (SLAR system), AN/APS-85-94, and succeeding items.	Aircraft-mounted "side-looking surveillance radar" system.	-----	Employed at field army, corps, missile command, and division levels. System will include data link and other ancillary equipment.
8	Airborne surveillance and mapping radar system, AN/APQ-55.	Aircraft-mounted "side-looking, high-resolution surveillance and mapping radar" system.	-----	Employed at field army, corps, missile command, and division levels. System will include data link and other ancillary equipment.

	1	2	3	4
1	Nomenclature	Description	Range	Remarks
9	Camera system, aerial surveillance, KA-20(1), and succeeding items.	Surveillance camera, mounted in drones and manned aircraft. Day and night photo reconnaissance capability.		Employed at all levels from battle group up. Camera system includes wing-mounting pods for cameras, flash and other illuminating devices, mounting hardware, and other ancillary equipment.

Section VI. FIELD ENGINEERING

4.28. General

These data are intended for use as general guides only. Their application should be varied to conform to local field conditions as required in each specific tactical situation, based on the recommendation, after reconnaissance, of the unit engineer charged with the task.

4.29. Roads and Bridges

a. *Traffic Capacity.* See paragraph 7.14.

b. *Load Capacity of Civilian Bridges.* Peacetime design includes high safety factors for unusual loads and deterioration. As a guide for military operations, it may be assumed that the ordinary civilian bridge in good condition will carry twice the rated civilian capacity when restrictions are placed on the speed and spacing of vehicles and on the number of lanes in use. However, it is advisable to have bridge capacity analyzed by an engineer officer.

c. *Road Capacity.* The capacity of a road is limited usually by the capacity of the bridges thereon.

d. *Marking Bridges and Vehicles.*

- (1) Bridges are marked with two types of signs: circular and rectangular. Circular signs, by means of symbols and numerals, indicate the one-way capacity classification of a bridge, wheeled or tracked class or both, as well as the capacity classes of a two-lane bridge when used as either a double- or single-lane bridge. The capacity of two-way bridges is marked by vertical

arrows under two respective one-way and two-way class numbers. When dual classification of bridges is to be posted, the wheeled and tracked classes are denoted by silhouette-type symbols together with the appropriate class numbers. When desired, rectangular signs located beneath the bridge class signs indicate any other information concerning the bridge, such as height or width limitations. Any bridge class which is a fraction of a whole number is *reduced* to the next *lower* whole number; for example, 22.7 would be reduced to 22.

- (2) Vehicles are marked with class numbers which represent the effect a vehicle will have on the bridge when crossing it; the effect is determined from the gross weight of the vehicle and the weight distribution. Classification numbers are assigned to all single vehicles in military use which have a gross weight exceeding 3 tons, and to all trailers in military use which have a rated payload exceeding 1½ tons. All *single* vehicles in excess of 3 tons gross weight carry front class signs only; a side vehicle classification sign is placed on the right side of classified *towing vehicles* and *trailers* exceeding 1½ tons. For *combination* vehicles, each leading vehicle in the combination carries a front vehicle's classification sign. It is in-

scribed with the classification number of the combination with the letter C in red above the classification number. In addition, each vehicle in the combination carries a side vehicle classification sign inscribed with its classification, as a single vehicle. In the case of towed vehicles, when the vehicles are less than 30 yards apart and both are on one bridge span at the same time, they are classed as combination vehicles. In these cases, the classification of the combination is the sum of the classification numbers of the separate vehicles. This combination classification number is shown on a temporary front sign. Special-purpose vehicles are equipped with front classification signs or side classification signs, depending on their

means of propulsion. For more detailed information, see FM 5-36.

e. Road Nets. See paragraph 8.5.

f. Engineer Road Construction. The net effective man-hours required for personnel of the engineer battalion to clear, grub, strip, and rough-grade 1 mile of combat road, pioneer type, are as follows:

Man-hours¹

	1	2	3
1	Terrain	14 feet one-way	24 feet two-way
2	Flat—prairie.....	1,500	2,200
3	Rolling.....	2,000	2,800
4	Hilly—forested.....	2,500	3,300

¹ Not included are requirements for the following tasks:

- a* Graveling and culvert construction See paragraph 8.5*b*
- b* Bridge construction See paragraphs 4.30 and 8.5*b*
- c* Road rehabilitation See paragraph 8.5*c*

4.30. River-and Gap-Crossing Equipment

a. Distribution of Class II Equipment.

	1	2	3	4	5	6
	Item	Inf div engr bn (TOE 5-15D)	Arind div engr bn (TOE 5-5D)	Abn div engr bn (TOE 5-225D)	Engr float brg co (TOE 5-78E)	Engr PNLBRG co (TOE 5-137D)
2	Boat, bridge erection, inboard engine, aluminum, gas-driven, 27-ft long		6		10	
3	Boat, landing, inflatable, assault craft, nylon cloth, 15-man	18	18	10	70	
4	Boat, reconnaissance, pneumatic, 3-man	18	3	6	10	
5	Bridge, armored vehicle launched, scissoring-type, class 60, aluminum, 60-ft length of span	6	9			
6	Bridge, fixed, highway, aluminum, 38-ft length of span			3		
7	Bridge, fixed, highway, pony truss, portable, panel-widened roadway, Bailey type					1
8	Bridge, floating, foot, aluminum, 472 ft 6 in				1	
9	Bridge, floating, highway, aluminum deck, balk superstructure, on pneumatic floats, M4TG, 141 ft 8 in		3		5	
10	Bridge, floating, raft section, light tactical	2			6	
11	Bridge erection set, fixed bridge, highway, pony truss, portable, panel-widened roadway, Bailey type					1
12	Bridge erection set, floating bridge, aluminum deck, balk superstructure		3		5	
13	Ferry conversion set, raft, infantry support				6	
14	Launcher, M48 tank chassis, transporting for 40- and 60-ft bridge, armored vehicle launched, scissoring-type, class 60	3	6			
15	Outboard motor, gas, 25 BHP	6	9		24	

b. Characteristics of Assault Boats.

	1	2	3	4	5	6	7	8
1	Type of assault boat	Type of propulsion	Maximum stream velocity (FPS)		Rated capacity (short tons)	Engineer crew	Typical loads	Total load in short tons ¹ (including crew)
			Make headway	Safely navigate				
2	M2.....	Paddles.....	4	No data available	2.00	3	Rifle squad plus 2 men. Rifle squad minus fire team plus ½ weapons squad (5 men).	1.65
3	Plastic, 16-ft	Paddles.....	4	5	1.69	3	W 3,000 rd cal .30 and 7 rd 3.5 ammunition.	1.73
		25 HP out-board	8	9	1.64	2	Rifle squad plus 2 men. Rifle squad minus fire team plus ½ weapons squad (5 men).	1.65
4	Pneumatic (15-man)	Paddles.....	5	8	1.70	3	81-mm mortar squad (minus driver) W 48 rd plus 4 men.	1.56
		25 HP out-board	8	12	1.65	2	81-mm mortar squad (minus driver) W 48 rd plus 5 men.	1.56
5	Ponton, M2..	25 HP out-board	7	No data available	3.95	2	2 rifle squads and 1 fire team.	3.19
							1 rifle squad and 1 weapons squad W 6,000 rd cal .30 and 14 rd 3.5 ammunition.	3.02
			9		2.70		2 rifle squads.	2.64
							Rifle squad and ½ weapons squad W 3,000 rd cal .30 and 7 rd 3.5 ammunition plus 4 men.	2.61

¹ Load figures are based on the following:

Rifleman, with individual equipment.....	220 lb
Machinegun, cal .30.....	49 lb
Launcher, 3.5-in. rocket.....	13 lb
Mortar, 81-mm, M29.....	115 lb
Cal .30 ammunition, 1,000 rd.....	85 lb
Launcher, 3.5-in. rocket, ammunition, 1 rd.....	9 lb
Mortar, 81-mm, ammunition, 1 rd.....	12 lb

c. Characteristics of Rafts.

1	Type of raft	Personnel required		Type of power unit required ¹	Number of pontoons or floats and type of construction	Length		Capacity classes ³												Numbers of rafts from one set ⁴	Transportation for raft equipment		
		Erection	Operation			Overall (with ramp) ²	Landing space	Normal crossings						Risk crossings									
								Stream velocities in feet per second (FPS)															
								3	5	7	8	9	11	3	5	7	8	9	11				
2	Infantry support ⁵	1 platoon	1 squad	Outboard motors, 25 HP	3 reinforced	38' 0"	24' 0"	1 8	1 8	2 4	(6) 2			1 10	1 9	2 5	(6) 3	(6) 2		1	1	2½-ton cargo truck and pole trailer	
					5 reinforced	50' 0"	35' 9"	1 13	2 10	3 5	(6) 3			1 15	2 13	3 8	(6) 5	(6) 3		0.6 or 0.7 W 1½ assault boat	2		
					7 reinforced	62' 0"	47' 9"	1 13	2 13	4 8	(6) 4			1 16	2 15	4 10	(6) 7	(6) 5		0.43 or 0.5 W 1 assault boat	2		
3	M4 ⁷ (Standard B)	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	87' 1"	51' 8"	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	1 50 55	4	5	2½-ton bolster truck and trailer
					6 reinforced			1 70 75	1 70 75	1 70 75	1 65 70	1 65 70	1 50 55	1 75 80	1 75 80	1 75 80	1 75 80	1 75 80	1 75 80	1 75 80	4	6	
					7 reinforced			1 85 90	1 85 90	1 85 90	1 80 85	1 80 85	1 55 60	1 90 95	1 90 95	1 90 95	1 90 95	1 90 95	1 90 95	1 90 95	1 90 95	4		7
4	Class 60 (Standard B)	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	92' 5"	51' 0"	1 40 45	1 40 45	1 40 45	1 35 40	1 35 40	1 25 30	1 50 55	1 50 55	1 50 55	1 45 50	1 45 50	1 45 50	1 35 40	2	5	5-ton bridge truck
					5 normal	107' 5"	66' 0"	1 50 55	1 50 55	1 50 55	1 45 50	1 40 45	1 30 35	1 60 65	1 60 65	1 60 65	1 55 60	1 50 55	1 40 45	1 35 40	2	6	
					5 reinforced	92' 5"	51' 0"	1 55 60	1 55 60	1 50 55	1 50 55	1 45 50	1 40 45	1 60 65	1 60 65	1 60 65	1 55 60	1 50 55	1 45 50	1 40 45	2	6	
					6 reinforced	92' 5"	54' 0"	1 65 75	1 65 75	1 65 75	1 60 65	1 60 65	1 50 55	1 80 90	1 80 90	1 80 90	1 75 85	1 70 80	1 60 70	1 45 50	2	6	
5	M4T6	1 platoon	1 squad	27' bridge erection boats ⁸	4 normal	87' 1"	51' 8"	1 50 55	1 50 55	1 45 50	1 40 45	1 35 40	1 30 35	1 60 65	1 60 65	1 60 65	1 55 60	1 50 55	1 45 50	1 34 40	2	5	5-ton bridge truck
					4 reinforced	87' 1"	51' 8"	1 50 55	1 50 55	1 50 55	1 45 50	1 40 45	1 35 40	1 60 65	1 60 65	1 60 65	1 55 60	1 50 55	1 45 50	1 45 50	2	5	
					5 normal	102' 1"	66' 8"	1 55 60	1 55 60	1 50 55	1 45 50	1 40 45	1 35 40	1 65 70	1 65 70	1 65 70	1 60 65	1 55 60	1 50 55	1 45 50	1.67	6	
					5 reinforced	88' 9"	50' 1"	1 60 65	1 60 65	1 60 65	1 55 60	1 55 60	1 45 50	1 70 75	1 70 75	1 70 75	1 65 70	1 65 70	1 65 70	1 55 60	1.96	6	
6	Relt, light, tactical	1 platoon	1 squad	Onboard motor, 25 HP	4 pontoons reinforced ¹⁰	(12)	33' 0"	1 16	1 16	1 16	1 12	1 8	1 13	1 20	1 20	1 20	1 16	1 11	1 4	1 13	1	2	2½-ton LWB cargo truck and pole trailer
				19' bridge erection boat	6 pontoons reinforced ¹¹			1 19	1 19	1 19	1 19	1 18	1 6	1 24	1 24	1 24	1 24	1 23	1 11				

LEGEND

Infantry Support Rafts Only

1

Number of power units required.

8

Single vehicle capacity.

13

Number of power units required

21

Single vehicle capacity.

21

2 vehicle capacity, approximately equal in weight.

All Other Rafts

1

Number of power units required.

50

Upper figure is wheeled vehicle capacity

55

Lower figure is tracked vehicle capacity.

Crossing characteristics	River width (feet)		
	250'	500'	1,000'
Number of round trips per hour in 5 FPS current in daylight	6	4	2
Rafts operated from one site	1	2	3
Number of round trips per hour in 5 FPS current in blackout	3	2	1

¹Although not shown on table, outboard motors can be used to advantage on all rafts in current velocities up to 5 FPS.

²Overall deck length, including overhang and ramps.

³Capacities are based on loading rafts with center of gravity of loads 6" downstream from centerline of raft and on properly inflated floats.

⁴Rafts and bridges are issued as sets by the appropriate supply manual.

⁵Wheeled and tracked vehicles have the same ratings.

⁶One 19' bridge erection boat per raft in currents of 8 and 9 FPS.

⁷One 19' and two 27' boats may be used here rather than three 27' boats.

⁸One 19' bridge erection boat may be used in currents not more than 4 FPS. In currents over 4 FPS, two 19' bridge erection boats may be substituted for one 27' bridge erection boat.

⁹Three 19' bridge erection boats may be used here rather than two 27' boats.

¹⁰Four pontoons beneath 3 treadways with 108" roadway. Articulator bays are not utilized.

¹¹Six pontoons beneath 4 treadways with 108" roadway. Articulator bays are not utilized.

¹²Varies, depending on whether normal or articulator bays are used with ramp.

¹³19' bridge erection boats used in lieu of outboard motors.

d. Characteristics of Standard Floating Bridges.

1	1		2		3	4	5	6	7		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
	Type of bridge		Transportation required ¹		Construction time in hours ²				Construction party ³		Main- te- nance crew	Capacity in tons ⁴																				Traffic capacity and vehicular distance for safe crossings in daylight (except as otherwise noted) ⁸
					Stream widths							Normal crossing (posted capacity) ⁵								Caution crossing ⁶						Risk crossing ⁷						
												Stream velocities in feet per second (FPS)																				
												150 ft	250 ft	500 ft	1,000 ft	3	5	7	8	9	11	3	5	7	8	9	11	3	5	7	8		9	11
2	Footbridge, aluminum, floating.		Three 2½-ton trucks or Two 2½-ton trucks W 2½-ton trailers per 472-ft 6-in. bridge.		(9)	(9)	(9)		1 plat	1 sqd	Safe					(10)	(10)													Day: 75 men per minute. Night: 40 men per minute (moonlight) 25; men per minute (blackout) at normal 2-pace distance. ¹¹		
3	M2 assault boat bridge,	Normal con- struc- tion	One 2½-ton truck W 1 pole tlr per 36 ft of bridge.		1	1½	2½		1 plat	1 sqd	8	6	5					8	6	5					9	7	6				200 vehicles per hour; 90-ft dis- tance between vehicles.	
4		Rein- forced con- struc- tion	One 2½-ton truck W 1 pole tlr per 24 ft of bridge.		1½	2	3		1 plat	1 sqd	13	9	7					13	11	8					14	12	9					
5	M4 floating bridge. (Standard B)		One 5-ton bridge truck per 15 ft of bridge (normal construc- tion).		3	5	8	14	1 ponton brg co plus 1 or 2 cmbt co	1 sqd	¹² (60) 60	(60) 60	(45) 50	(40) 45	(30) 35	(18) 20	(68) 68	(65) 65	(58) 59	(52) 53	(44) 46	(29) 31	(72) 72	(68) 68	(61) 62	(58) 59	(53) 54	(37) 39	400 vehicles per hour. See footnotes 5, 6, and 7.			
											(100) 100	(100) 100	(100) 100	(85) 85	(70) 70	(35) 40	(105) 105	(105) 105	(105) 105	(95) 95	(85) 85	(55) 55	(110) 110	(110) 110	(110) 110	(105) 105	(100) 100	(70) 70				
6	Class 60 float- ing bridge. (Standard B)		One- 5-ton bridge truck per 15 ft of bridge.		1½	2½	4½	8½	1 float brg co plus 1 or 2 cmbt co	1 sqd	¹³ (60) 65	(55) 65	(45) 55	(40) 50	(35) 45	(22) 25	(65) 70	(62) 67	(56) 61	(52) 56	(45) 49	(34) 37	(75) 79	(72) 77	(67) 72	(62) 67	(57) 62	(46) 50	400 vehicles per hour. See footnotes 5, 6, and 7.			
7	M4T6 floating bridge.		One 5-ton bridge truck per 15 ft of bridge.		2	3	5	10	1 float brg co plus 1 or 2 cmbt co	1 sqd	(50) 55	(45) 55	(40) 50	(35) 45	(30) 40	(25) 30	(60) 61	(58) 59	(54) 55	(49) 51	(45) 47	(35) 37	(68) 69	(66) 67	(62) 63	(59) 60	(54) 56	(43) 45	400 vehicles per hour. See footnotes 5, 6, and 7.			
8	Light tactical bridge.		Two 2½-ton LWB cargo trucks W 2½-ton pole tlr per 33 ft of bridge.		1	1½	2½		1 plat	1 sqd	16	16	13	11	8	2	18	18	15	12	9	3	21	21	17	14	11	5	200 vehicles per hour. See footnote 14.			

¹ Transportation for bridge equipment only. Additional needed for any construction equipment required and for troops.
² Includes unloading and construction only in daylight. Does not include access roads, assembly sites, abutments, or anchorages, except as noted.
³ Average for trained troops and continuous daylight construction. Allowances are required for specific situations.
⁴ Based on abutments at levels within 12" of floating bridge deck level.
⁵ Vehicle anywhere on width of bridge deck. Speeds 3-15 MPH for wheeled vehicles, 2-8 MPH for tracked vehicles. Vehicle spacing as dictated by tactical commander. Minimum spacing 90'.
⁶ Center of vehicle within 12" of bridge centerline. Maximum speed 8 MPH for wheeled vehicles, 5 MPH for tracked vehicles. Minimum spacing 150'; no sudden stopping, accelerating, or gear shifting.

⁷ Center of vehicle within 9" of centerline and with guide. Maximum speed 3 MPH. One vehicle on bridge. No stopping, braking, or gear shifting.
⁸ Traffic capacities are for all traffic moving forward or rearward.
⁹ This time does not include installation of the anchorage system.
¹⁰ In currents above 8 FPS, the capacities are reduced 20 percent.
¹¹ Decrease capacities by 20 percent in currents over 8 FPS. Capacities are based on minimum interval of 5' between men or 2 or less men per bay.
¹² Upper figures in parentheses represent normal construction and lower figures represent reinforced construction.
¹³ Upper figures in parentheses represent wheeled load class and lower figures represent tracked load class.
¹⁴ Capacities for light tactical bridge are based on a 108" roadway with an 18' reinforced end span without articulator bays.

e. Characteristics of Fixed Bridges Which May Be Constructed from Floating Bridge Components.

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PART I
4.30

1	2	3	4	5	6	7	8	9
Type of bridge	Spans	Crossing capacities ¹			Maximum utilization of one bridge set ²			
		Normal	Caution	Risk	Number of single spans	Length of multi-span with trestles		
						Ground braced ³	Fully braced ⁴	Pier ⁵
Class 60 (Standard B)	24'	120 100	120 100	120 100	20			96'
	26'	120 95	120 100	120 100	20			104'
	28'	115 80	120 87	120 100	20			112'
	30'	105 65	110 75	120 90	13		165'	120'
	32'	95 60	105 70	120 85	13		173'	128'
	34'	85 55	90 63	110 75	13		181'	136'
	36'	75 50	81 58	100 68	13		189'	144'
	38'	65 45	75 53	90 65	13		197'	152'
	40'	60 40	68 50	83 60	13		205'	160'
	50'	30 30	36 36	50 45	10	350'	245'	
	60'	20 22	22 25	28 30	8	420'		
M4 ⁶ (Standard B)	15'	120 100	120 100	120 100	12	195'	195'	105'
	21' 8"	120 100	120 100	120 100	4			86' 8"
	23' 4"	120	120	120	2			46' 8"
	30'	80 60	100 80	110 90	4		165'	120'
	38' 4"	45 35	70 55	80 60	2		91' 8"	76' 8"
	45'	23 25	45 40	54 45	3	135'	165'	
M4T6 ⁶	15'	120 100	120 100	120 100	10			30'
	21' 8"	120 100	120 100	120 100	1.8			
	23' 4"	120 100	120 100	120 100	3			46' 8"
	30'	80 60	100 80	110 90	3.6		75'	60'
	38' 4"	45 35	70 55	80 60	3		91' 8"	76' 8"
	45'	23 25	45 40	55 45	3.4	135'	105'	
Bridge, fixed, aluminum, hwy-type, 38-ft spans ⁶	15'	120 100	120 100	120 100	2			
	21' 8"	120 100	120 100	120 100	1.5			
	23' 4"	120 100	120 100	120 100	1			
	30'	80 60	100 80	110 90	1			
	38' 4"	45 35	70 55	80 60	1			
	45'	23 25	45 40	55 45	0.8			

¹Dual class capacities are given for each span. The upper figure is wheeled vehicle class capacity; the lower, tracked vehicle.

²Using expedient approach ramps.

³Trestle braced against the ground with struts, class 0-30.

⁴2 trestles spaced 15' apart and braced against each other with bracing struts, spans of length indicated in table between pairs of trestles; class 31-70.

⁵2 trestles spaced from 6' to 15' apart with expedient stringers (12 X 12 timbers or deck baulk) across the 2 trestle transoms. Spans of bridge bear on center of trestle pier formed; class 71-100.

⁶Capacities are based on the use of a 22 baulk deck and 18 baulk roadway. Capacities for other types of assembly are shown in the following table.

Capacity

Span	Normal	Caution	Risk
130'	95/70	100/80	110/90
238' 4"	65/50	88/60	98/67
245'	42/35	59/46	67/53

¹18 baulk roadway—23 baulk deck width.

²18 baulk roadway—26 baulk deck width.

f. Characteristics of Fixed Highway Bridges.¹

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1	Type T6 (width 13'6")				Panel bridges																						Beam bridges ²				Truss and girder bridges ²		
2					Bailey type, M2																						I-beam stringers ³		WF beam stringers ⁴		Truss ³	Girder ⁴	
3					Single-single			Double-single			Triple-single			Double-double			Triple-double			Double-triple			Triple-triple			30' span ⁵	60' span ⁵	27" depth ⁶	36" depth ⁶	90' span ⁵	48" depth ⁶		
					N	C	R	N	C	R	N	C	R	N	C	R	N	C	R	N	C	R	N	C	R								
4	30				30	42	47																										
					30	37	42																										
5	40				24	36	40																					100					
						34	38																										
6	50					33	36	75	83	88																							
					24	31	35	70	86	84																							
7	60				20	30	33	65	77	85																							
						29	32	65	73	79																							
8	70				20	24	30	60	68	78																							
						30	60	69	75																								
9	80				16	20	24	50	60	66	85	95	100														50	50		100	50		
						55	60	64	80	90	90																						
10	90				12	16	19	40	50	55	65	74	82																				
						45	50	55	65	75	82																						
11	100				8	12	14	30	37	42	50	57	64	80	86	96																	
						30	39	44	55	60	66	80	90	90																			
12	105	95																															
		100																															
13	110							20	30	34	35	47	52	65	72	80	90	100	100													100	
									32	36	40	49	54	70	76	83	90	90	90														
14	120	70						16	23	27	30	38	43	45	57	64	75	83	91														
		75							30	35	41	45	55	61	68	80	90	90															
15	130							12	18	21	20	31	35	35	47	53	55	65	74	70	80	90											
												33	38	45	50	56	60	72	80	80	90	90											
16	135	60																															
		65																															
17	140						8	14	17	16	24	29	30	39	44	45	57	64	70	80	88												
											31	35	42	48	55	62	70	70	90	90													
18	150	45	105								12	18	22	24	32	36	35	47	54	60	77	85											
		55	100												35	40	45	51	58	60	85	90											
19	160									8	15	17	16	25	30	30	37	45	55	69	80	80	100	100									
															33	35	41	48	55	78	89	75	90	90									
20	165	35	85																														
		45	90																														
21	170									4	10	13	12	19	24	20	31	36	45	57	64	70	80	90									
22	180		75											8	15	18	16	24	29	35	48	55	66	77									
			80																														
23	190																12	18	22	30	39	46	45	59	68								
24	195		65	110																													
			75	100																													
25	200																																
26	210		55	90																													
			60	100																													
27	225			75																													
				80																													
28	240			60																													
				60																													
29	255			50																													
				50																													

¹ Upper figure represents wheeled load class; lower figure represents tracked load class.
² Dual classification data are not available.
³ With one line of traffic.
⁴ 22' roadway.
⁵ Length of one unit.
⁶ Depth of beam or girder.
⁷ Limited by roadway width.

g. Characteristics of Railway Bridge Equipment.

1		2	3	4	5	6	7	8	9	10	
1	Type of bridge	Bridge sets		Shipping data ³		Maximum speed at Cooper's E-45 loading (MPH)	Construction effort in man-hours ⁴	Erection equipment ⁵		Steel trestle units ⁶	
		Procurement ¹	Theater issue ²	Weight (STON)	Cubage (MTON)			Special sets	Components		
2	Through truss	123' span	92'3" span			40	No data	Special set for spans 92'3" to 123'	Lowering frames, erection derrick, miscellaneous equipment, equipment for special methods.	T-type: piers 2'8"-70'8" in 1'4" increments. For bridge seatings, see TM 5-374.	
			102'6" span			40					
			112'6" span			40					
			123'0" span	133.66	131.00	40	7,200	Special set for spans 133'3" to 153'9"			
			133'3" span			40	No data				
			143'6" span			20	9,000				
			153'9" span			10	No data				
		Set A—(end posts from sloped to vertical)		1.68	0.50	NA	NA	Special set consisting of erection frame and erection gantry			
		Set B—(end posts from square to skew)	Set B	1.77	1.34						
		Set C—(connect two spans with sloped end posts)	Set C	0.18	0.14						
		Set D—(connect two spans with vertical end posts)	Set D	0.27	0.20						
		Set K—(lengthen span to 153'9")	Set K	38.84	31.78						
3	Wide-flange beam	27"	22' span (2 beams)	No data	6.10	4.80	40	100	None	No data	Various
			34' span (4 beams)		14.40	12.30		150			
			40' span (6 beams)		19.00	16.60		210			
		36"	35' span (2 beams)		12.40	10.50	40	170			
			45' span (4 beams)		28.40	24.70		470			
			57' span (6 beams)		39.90	35.00		540			
	Plate girder, 48"	56' span (2 girders)	31.50		24.10	40	370				
		80' span (4 girders)	66.90		51.80		660				
		100' span (6 girders)	117.50		88.60		1,200				
5	I-beam ⁷	17' span (four 18" girders)	17' span	2.55	1.67	25	100-400	None	Erection gantry, erection derrick, equipment for special methods, miscellaneous equipment.	L-type: piers in heights from 3'-93' in 6" increments. For bridge seatings, see TM 5-374.	
		21' span (six 18" girders)	21' span	4.32	4.00	40					
		27' span (four 24" girders)	27' span	5.70	5.10	25					
		31' span (six 24" girders)	31' span	9.33	8.49	40					
		35' span (six 24" girders)	35' span	10.40	9.56	40					
		Set I—(splice one 24" I-beam)	Set I	0.10	0.04	NA					
		Set J—(splice one 18" I-beam)	Set J	0.07	0.04						
6	Unit construction	Deck-type	70' span, deck, two-girder	70'	72.66	44.93	40	1,100	NA		
			70' spans with set F	85'	145.32	89.86	40	1,600			
			Set F—material required in addition to material in two 2-girder 70' spans to construct one 3-girder 85' span. ⁸		5.15	1.59	NA	NA			
		Through-type	70' span, through, two-girder ⁸	70'	48.68	33.02	40	1,220			
			85' span, through, four-girder	85'	96.00	70.00	40	1,560			
			Set E—used to convert 70' 2-girder through-type to 70' 2-girder deck-type.		1.89	0.62	NA	NA			
			Set G—used to connect two 70' through-type spans.	Set G	0.23	0.20					
			Set H—(convert square to skew ends)	Set H	3.14	2.70					

¹ These bridge sets for specific span lengths, and conversion sets to change or supplement a bridge set, are procured and furnished to theater of operations.

² Theaters make up these bridge sets for specific span lengths from stocks of components furnished in the procurement sets. Conversion sets to change truss construction (A, E, F) are used in assembling the theater sets. The other conversion sets are issued for use by the constructing unit. For special construction, components are issued rather than sets. See TB ENG 56 for detailed information.

³ The shipping data are the weight of the crated set.

⁴ Tentative. Figure is computed from the arrival of equipment on the site and includes unloading and construction. For eight, increase by 50 percent. Time for erection of piers, approaches, and approach spans is not included. Bridge truck is a separate facility.

⁵ The theater is furnished a supply of basic sets of railway bridge erection equipment. This equipment is issued to units constructing railway bridges in special sets, made up of the items required to construct a specified length and configuration of bridge. Other standard items of erection equipment are furnished to constructing units by component, depending on the type of bridge and the construction conditions.

⁶ The light standard (L-type) and standard (T-type) trestles are furnished to the theater and to the field as components.

⁷ The I-beam span sets will assemble either square or skewed with the exception of the 17' and 21' spans, which require an extra L-6 member for skewed assembly.

⁸ Special sets are available for spans from 50'-85' in 5' increments in deck girders and 55'-85' in 5' increments in through girders.

h. Logistical and Construction Data for Military Fixed Highway Bridges,

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1		Panel bridges										Beam bridges				Truss and girder bridges	
2		Type T6 (width 13' 6") Effective length of bay 15'				Bailey-type, M2 Effective length of bay 10'						I-beam stringers		WF beam stringers		Truss	Girder
3		Single truss	Double truss	Triple truss	SS	DS	TS	DD	TD	DT	TT	30' span ¹	60' span ¹	27" depth	36" depth	90' span ¹	48" depth ¹
4	Weight per bay (short tons) ²	7.7	15.4	23.1	2.76	3.41	4.01	4.66	5.88	6.46	8.29	12.9	35.3	31.2	116.0	49.9	177.0
5	Cubage per bay (meas tons) ³	61.5	80.0	98.6	9.00	11.00	13.00	14.00	18.00	20.00	26.00	15.5	36.0	28.5	105.0	70.7	142.4
6	Type of issue (class)	IV	IV	IV	II	II	II	II	II	II	II	IV	IV	IV	IV	IV	IV
7	Transportation per bay ⁴	1.3	2.6	3.9	3.40 1.00	2.20 0.70	2.60 0.70	3.00 0.70	3.80 0.90	3.70 0.80	5.50 0.90	No data		No data		No data	
8	Man-hours to erect one bay ⁵	11.2	22.4	33.6	58.00	37.00	49.00	63.00	98.00	171.00	281.00	No data		No data		No data	

¹Length of span is considered to be one bay.

²Data on Bailey-type, M2, bridge do not include weight of ramps, launching nose, footwalks, wear treads, and truss guards. Weight of overhead bracing is included on DT and TT.

³Values are approximate only and subject to change because of revised packaging and changes in components of sets.

⁴Based on combat loading in 5-ton military bridging truck (loaded for manpower erection) for T6 and 2½-ton dump trucks with 2½-ton utility pole trailers for M2 Bailey. Includes launching nose, grillage, footwalks, and spars. Number of vehicles is based on the number required to transport the minimum length of span of the type of construction indicated, which will carry class 50 tracked loads.

⁵Does not include time for preparation of approach roads, assembly sites, or elaborate abutments. Adjustments must be made for specific site conditions. Based on manpower erection of the minimum length span of the type of construction indicated which will carry class 50 tracked loads.



Number of 2½-ton dump trucks.

Number of 2½-ton utility pole trailers.

4.31. Field Fortifications

a. Priority of Work. The order in which the various defensive measures are to be executed is expressed in the form of priorities. The assignment of priorities does not prevent simultaneous work on several tasks. After the location of combat emplacements has been fixed, the normal priority is—

- (1) Establishing security.
- (2) Positioning weapons.
- (3) Clearing fields of fire, removing objects, masking observation, and determining ranges to probable target location.
- (4) Providing signal communication and observation systems.
- (5) Preparing weapons emplacements and individual positions, to include over-

head cover, and camouflaging them concurrently.

- (6) Laying minefields and preparing important demolitions.
- (7) Preparing routes for movement and for supply and evacuation.
- (8) Preparing alternate and supplementary positions.
- (9) Preparing obstacles (other than minefields) and less vital demolitions.
- (10) Preparing CBR protective shelters as required.
- (11) Preparing deceptive installations in accordance with deception plans of higher headquarters.

b. Works. (Figures are for daylight; for work at night, increase labor by 50 percent.)

(1) Characteristics of personnel and individual weapons emplacements.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Type of emplacement or shelter	Protection afforded ¹							Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools ⁴					Weight and volume of materials							
		Nuclear weapons effects ²				Conventional weapons effects ³								Revetment materials for cover support only				Complete revetment			
		Nuclear radiation transmission factors			Fortification protection factor	Thermal effects	Tracked vehicles	Artillery fragments	Revetment materials for cover support only		Complete revetment	No revetment materials used	Corrugated metal construction ⁶		Sized lumber construction		Corrugated metal construction ⁶		Sized lumber construction		
		Initial gamma	Initial neutron	Residual gamma ⁵					Corru- gated metal const	Sized lumber const			Corru- gated metal const	Sized lumber const	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)
		2	Improved crater	0.6	0.8	0.3	90	Fair	Virtually none	Better than in open	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA
3	Skirmishers trench	0.8	0.9	0.5	95	Fair	Virtually none	Better than in open	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA
4	Prone emplacement	0.4	0.7	0.2	85	Good	Virtually none	Fair	NA	NA	NA	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA
5	Open one-man foxhole	0.09	0.3	0.1	65	Very good	Good	Good	NA	NA	3.5	4.5	2.0	NA	NA	NA	NA	190	3.5	240	8
6	Open one-man foxhole with offset	0.004	0.008	0.00001	20	Excellent	Very good	Excellent	9.0	14.0	10.0	16.0	NA	50	0.6	180	5.5	240	4.0	420	13.0
7	One-man foxhole with half cover	0.08	0.2	0.04	55	Very good	Fair (—)	Very good	2.5	3.0	4.5	5.5	NA	10	0.1	20	0.6	200	3.5	260	8.0
8	One-man hoxhole with half cover and offset	0.003	0.008	0.00001	20	Excellent	Very good	Excellent	10.0	14.0	12.0	18.0	NA	60	0.7	200	6.0	250	4.0	440	14.0
9	Open two-man foxhole	0.1	0.3	0.1	65	Good	Good	Good	NA	NA	6.0	8.0	3.0	NA	NA	NA	NA	280	5.0	320	10.0
10	Deepened two-man foxhole	0.07	0.15	0.1	55	Very good	Good	Very good	NA	NA	8.0	10.0	5.0	NA	NA	NA	NA	300	5.5	375	12.0
11	Two-man foxhole with half cover	0.09	0.2	0.04	60	Very good	Fair to good	Very good	4.0	4.0	8.0	10.0	NA	15	0.2	32	1.0	280	5.0	350	11.0
12	Two-man foxhole with half cover and two offsets	0.002	0.003	0.00001	15	Excellent	Very good	Excellent	20.0	30.0	22.0	35.0	NA	120	1.5	400	12.0	380	6.0	700	22.0
13	Two-man foxhole with half cover and adjoining shelter	0.01	0.02	0.0005	30	Excellent	Good	Excellent	11.0	17.0	13.0	22.0	NA	100	1.2	560	18.0	460	7.0	880	28.0
14	Open fighting trench (25' length) ⁶	0.04	0.7	0.3	85	Good	Fair	Fair	NA	NA	28.0	32.0	21.0	NA	NA	NA	NA	490	8.0	710	22.0
15	Fighting trench with full cover (25' length)	0.15	0.4	0.03	70	Excellent	Fair	Very good	27.0	29.0	35.0	40.0	NA	240	4.0	360	11.0	730	12.0	1,060	33.0

¹Protection afforded assumes the occupants of fortifications are in the most protected position of their fortifications. For most fortifications, protection decreases as the angle of sight from the position to the center of the weapon burst increases.

²For blast effects, see FM 5-15, paragraph 16.

³a. For direct fire weapons effects, see FM 5-15, paragraph 9.

b. For close combat weapons effects, see FM 5-15, paragraph 7.

⁴Assumes normal digging capability in daylight with trained troops.

⁵Assumes fallout is kept out of hole at surface level by some sort of cover.

⁶May include wooden framing and braces.

Note. Classification of Fortifications by Attenuating of Residual Radiation.

a. Fortifications may be generally classified according to their attenuation of residual radiation. Such classification is shown below:

Fallout Attenuation Classifications

Transmission factors	Classification	General guidance in high-level radiation field
Less than 0.001.....	Excellent.....	Remain in place.
0.001 to 0.005.....	Good.....	Probably remain in place.
0.005 to 0.01.....	Fair.....	Probably leave position at optimum time.
More than 0.01.....	Poor.....	Leave position at optimum time.

b. A general idea of the dose to be expected with the classifications shown above is tabulated below, using a fallout arrival time of H+1 and a stay time of 96 hours. Under these conditions, the total incident dose in rad is exactly three times the dose rate of H+1. Assuming an H+1 dose of 5,000 rad hour:

Interior Dose for Various Fallout Classifications*

Classification	Total dose
Excellent	Less than 15 rad*
Good	15 to 75 rad*
Fair	75 to 150 rad*
Poor	More than 150 rad*

*See conditions in FM 5-15, appendix II, on fortification protection factor.

(3) *Clearing.* Four man-hours of labor are required for clearing 100 square yards of brush and a few trees up to 12 inches in diameter; for brush only, 2 man-hours.

(4) *Barbed-wire obstacles.*

(a) *Estimating requirements.* The minimum length of tactical wire en-

(b) *Wire entanglement materials for 300 yards of entanglements.*

tanglements for a defensive position is one and one-fourth times the frontage; minimum protective wire is five times the frontage. The length of tactical wire entanglements for a deliberate defense is five times the frontage; protective wire is six times the frontage.

	1	2	3	4	5	6	7	8	9	10	11
1	Type of entanglement	Pickets				Barbed wire, 400-yd, 115-lb reels ¹	Concertinas	Staples made of 1/2" round driftpins	Man-hours to erect 300 yd of entanglement ²	Short tons	Measurements
		Extra long	Long	Medium	Short						
2	Double-apron, 4- and 2-pace.....		91		182	12-13			54	1.50	1.40
3	Double-apron, 6- and 3-pace.....		61		122	11-12			45	1.05	0.98
4	High-wire (less guy wires).....		181			15-18			72	1.80	1.70
5	Low-wire, 4- and 2-pace.....			91	182	9			45	1.10	1.00
6	Four-strand fence.....		91		2	3 1/2-4			18	0.60	0.60
7	Double-belt expedient concertina.....		92		4	2	³ 90	270	36	2.10	2.00
8	Triple-belt expedient concertina, pyramided.	46	92		6	3	³ 135	270	90	3.15	2.90
9	Triple-belt standard Dannert concertina.		146		4	2	54	290	27	2.25	2.10

¹Lower number of reels applies when screw pickets are used; higher number when U-shaped pickets are used. Add difference between these two to the larger number when wood pickets are used.

²With exception of triple-belt concertina, man-hours are based on use of screw pickets. When driven pickets are used, add 20 percent to man-hours. With experienced troops, reduce man-hours by one-third. Increase man-hours by 50 percent for night work.

³Based on concertinas being made up in rear areas and ready for issue. One expedient concertina opens to 20-foot length (as compared with 50 feet for a commercially made Dannert concertina) and requires 100 yards of stranded barbed wire; also small quantities of No. 10 and No. 16 smooth wire for ties.

(c) *Wire materials for making expedient concertinas for 300 yards of entanglements.*

1	Type of concertina	Standard barbed wire, 400-yd reels	No. 10 wire, 100-lb coils	No. 16 wire, 10-lb coils
2	Double-belt.....	23	1	1
3	Triple-belt.....	34	1	1

4.32. Minefields

a. For detailed information pertaining to mine warfare, see FM 20-32.

b. Standard Mines.

1	2	3	4	5	6	7	8
	Description	Net wt (lb) (ea)	Shipping container			Remarks	Storage requirements
			Units per container	Type	Gross wt (lb)	Cubage (cu ft)	
2	Mine, antitank, HE, light, M7A2	4.50	8	Metal box.	56.0	0.99	Packed complete (W 8 fuzes, mine, AT, M603) (standard).
3	Mine, antitank, HE, heavy, M6A2	20.00	1	Metal crate.	29.2	0.46	Packed complete (W 1 fuze, mine, AT, M603) (WO activator) (standard).
4	Mine, antitank, HE, heavy, M15	31.46	1	Wooden box.	49.0	1.17	Packed complete (W 1 fuze, mine, AT, M603, and 1 activator) (standard).
5	Mine, antipersonnel, M2A4	5.30	10	Wooden box.	76.6	1.24	Packed 1 complete mine (W 1 fuze, mine, M6A1, and 1 spool of four 26-ft length of steel wire/carton, 10 cartons) (10 complete mines W accessories) (standard).
6	Mine, antipersonnel, M3	10.30	6	Wooden box.	73.2	0.83	Packed 6 complete mines (W 6 fuzes, mine comb, M7A1, and 6 spools of steel wire) (standard).
7	Mine, antipersonnel, nonmetallic, M14.	0.20	90	Wooden box.	44.1	1.70	Packed 1/carton (90 mine fuzes integral and 90 detonators, M46, in set up box and 9 wrenches, M22).
8	Mine, antipersonnel, M16	8.25	4	Wooden box.	44.8	0.77	Packed 4 mines (W 4 fuzes, mine comb, M-605, scaled mtl center, W 4 spools trip wire, and 1 wrench, M25).
9	Mine, antitank, nonmetallic, heavy, M19.		2	Wooden box.	75.0	1.49	Packed 1 complete mine (W 1 fuze, mine, M606, and 1 activator).
10	Flare, mine, trip, M49		16	Wooden box.	44.9	1.03	Packed (16 flares/package, between separators/wooden box).

c. *Minefield Estimates.* The following table may be used for initial estimates of requirements for mines and labor required to emplace various types of minefields (see also par. 4.19e).

MINEFIELD
Materiel and manpower requirements

	1	2	3	4	5
		Average requirements per 100 yd of minefield trace			
1	Materiel	Antipersonnel minefield ¹	Antitank minefield ¹		
			Protective	Defensive	Barrier
	<i>Antitank mines:</i>				
2	Heavy metallic.....		100	² 100	³ 180
3	Heavy nonmetallic.....				³ 120
4	Total antitank mines.....		100	100	300
	<i>Antipersonnel mines:</i>				
5	Bounding fragmentation.....	⁴ 400	⁴ 200	⁴ 400	⁴ 400
6	Nonbounding blast (nonmetallic).....	800		800	800
7	Total antipersonnel mines.....	1,200	200	1,200	1,200
	<i>Firing devices for mine activation:</i>				
8	Assorted.....			10	120
	<i>Trip flares:</i>				
9	Parachute.....	15		15	15
10	Candle.....	5	20	5	5
11	Total flares.....	20	20	20	20
	<i>Barbed wire (marking fence only):</i>				
12	400-yd reels.....	2.25	2.25	2.25	2.2
	<i>Pickets (marking fence only):</i>				
13	Long.....	93	93	93	93
14	Anchor.....	12	12	12	12
	<i>Manpower:</i>				
15	Man-hours.....	80	55	96	139
16	Platoon hours.....	2.3	1.6	2.8	4
	<i>Tonnages:</i>				
17	Short tons.....	2.7	3.7	5.2	9.2
18	Measurement tons.....	3	4.1	5.1	10.2

¹ Minimum desirable minefield densities per yard of minefield trace are as follows.

	AT ¹	A pers (fragmentation)	A pers (blast)
a. Protective.....	1	2	0
b. Defensive.....	1	4	8
c. Barrier.....	3	4	8
d. Antipersonnel.....	0	4	8

² Five percent activated with two firing devices for each mine

³ Twenty percent activated with two firing devices for each mine

⁴ Fifteen percent trip wired

Notes 1 The above data on materiel and manpower requirements are based on a standard pattern, with three strips for antipersonnel, protective and defensive minefields and a standard pattern with nine strips for a barrier minefield

2. Mine and manpower requirements for an irregular outer edge (IOE) strip are not included in the above table. IOE strip mine requirements for all antitank minefields are determined by computing one-ninth of the mine requirements for a three-strip standard pattern.

3. No safety factor for loss or damage to mines and fuzes in transport is included in the data above. Normally 10 percent of the total computed mine and fuze requirements should be added to insure an adequate supply of operable mines.

4. For detailed data pertaining to minefields, see FM 20-32.

d. Minefield Clearance. The following table may be used for initial estimates of time and materiel requirements for clearing or breaching minefields.

MINEFIELD BREACHING/CLEARANCE

Average time and materiel requirements

1	Method	Width of cleared lane (in yards)	Man-hours required per 100 yards	Remarks
	MANUAL			
2	Location by probing.....	1 (footpath).....	15-20	See note.
3	Removal by rope or explosives.....	4 (vehicle lane).....	35-40	See note.
4	Location by detector, assisted by probing.....	4 (vehicle lane).....	25-30	See note.
5	Removal by rope or explosives.....	25.....	200-225	See note.
	EXPLOSIVE			
6	Demolition snakes, M3A1.....	3-4.....	0-75	Employment time only. 90-100 hr required for assembly of M3A1.
7	Cable, antipersonnel, M1.....	1 (footpath).....	3-4	Cable, antipersonnel, M1, is not effective against antitank mines.
8	Bangalore torpedo.....	1 (footpath).....	3-4	See note.

Note. Based on average conditions of visibility and moderate enemy activity and normal U.S. countermeasures; i.e., screening of enemy observation and counterbattery fires against hostile artillery or other weapons covering the field.

4.33. Demolition

a. Explosive requirements for various demolition tasks vary widely, depending on the size of the structure, type of construction, type of materials in the structure, age, location, neces-

sary safety precautions, and other factors.

b. The following table may be used for initial estimates of explosive requirements for the more common types of demolition tasks required in creating obstacles.

Materiel and manpower requirements for individual targets and obstacles

1		Bridges		Tunnels	Abatis	Road craters
		Highway	Railroad			
2	Explosive (pounds).....	1,500	3,000	18,000	300	
3	Cratering charges (40-pound can).....					17
4	Manpower (squad hours).....	3	4	4	3	2

c. For classified data, see FM 101-10, Part III, paragraph 4.8.

4.34. Fordable Depth of Water¹

1	Type unit	Depth (ft)
2	Infantry on foot.....	3½
3	Trucks and truck-drawn artillery.....	2 2
4	Light tanks.....	2 1-3
5	Medium tanks.....	2 2-4
6	Heavy tanks.....	2 4-6

¹ Moderate current, hard bottom

² May be materially increased by suitable waterproofing. For streams of high current velocity, the attitude of the tank to the current has an appreciable effect on the depth which may be forded. The length of time the tank is exposed to the current also has an appreciable effect. Forty-eight inches is the design fording depth of modern U S tanks. Experience indicates that tanks can ford slightly greater depths for short distances without going out of action.

4.35. Load-Bearing Capacity of Ice

The strength of ice varies with the structure of the ice; the purity of the water from which it is formed; the cycle of formation, or freezing, thawing, and refreezing; temperature; snow cover; and water currents. The sustaining capacity of ice is not definitely determined, but

experience and tests provide working-capacity figures for good quality ice of varying thicknesses as given in the table below.

1	Load	Minimum thickness of ice (in.)	Minimum interval between tracks, or distance between elements (ft)
2	Single rifleman on skis or snowshoes.....	1½	16
3	Infantry columns, single horses, motorcycles, unloaded sleds.....	4	33
4	Single light-artillery piece; ¼-ton truck, 4 x 4.....	6	49
5	Light artillery, passenger cars, light total load of 3 tons.....	8	65
6	2½-ton trucks, light loads..	10	82
7	Closed columns of all arms except armored force and heavy artillery.....	12	98
8	Armored scout cars, light tanks.....	14	115
9	20-ton vehicles.....	16	131



CHAPTER 5

LOGISTICS—SUPPLY

Section 1. GENERAL

5.1. Use of Logistical Data

The logistical data contained in this and the succeeding four chapters (Logistics—Evacuation and Hospitalization; Logistics—Transportation; Logistics—Service; and Logistics—Management) are of the type suitable for first approximation planning. They are, for the most part, based on World War II and Korean experience, modified to reflect changes in concept and organization. Detailed logistical planning should be based on the references listed in the foreword.

5.2. General Supply Factors

a. The following broad general factors are useful for long-range planning when the figures in the remainder of this chapter are too detailed. They should be used only in forming rough estimates in logistical planning or as “rule of thumb” checks against the calculations of technical planners. The overall theater factors given below include only military requirements and are based on the following ratios between ground and air: For each division slice of approximately 40,000 men, there will be 2 airwing slices of 7,000 men each (par. 5.49a).

b. Initial Equipment and Initial 30 days of Maintenance.¹

	1	2	3	4	5	6
	Item	Total requirements per man in the theater (Army plus AF) ¹		Shipped from CONUS		Procured in theater of operations ²
		Measurement tons per man	Short tons per man	Measurement tons per man	Short tons per man	Short tons per man
1						
2	Initial equipment.....	8 00	1.80	8.00	1 80	
3	30 days' maintenance:					
4	Dry cargo.....	1.35	0.75	1.10	0.60	0.15
5	Bulk POL.....	³ 0.43	0.30	³ 0.43	0.30	
6	Total.....	9 78	2.85	9.53	2.70	0 15

¹ For use as broad initial planning factors. Does not include tonnages involved in buildup of theater reserves.

² Applicable only in situations when procurement in the theater of operations is feasible.

³ Bulk petroleum normally is not expressed in measurement tons. This figure is provided in this table merely for the purpose of comparison with dry cargo.

Section II. CLASS I SUPPLY

5.3. Characteristics of Standard Rations

1	Type ration	Packaging information			Average weight per ration, including packing (lb)	Remarks
		Number rations per package (case)	Weight per package (lb) (case)	Volume per package (cu ft) (case)		
2	Field A				6.0	This is the basic field ration. It consists of such perishables as fresh and frozen meats, vegetables, and fruit. It is intended for use primarily under stable conditions and during static phases of military operations when normal cooking and refrigeration facilities are available. It should be issued in preference to any other type of ration whenever it is available and circumstances permit its use.
3	Standard B ration for Armed Forces.				6.0	Same as the field ration, with nonperishables substituted for perishables. Designed for use where refrigeration facilities are lacking or impracticable but where kitchen and cooking facilities are available. (See SB 10-495.)
4	Small detachment, 5 persons.	5 rations	28.5	1.10	5.8	Five different menus. Should not be eaten cold. Intended to be served hot. Field cooking equipment required for preparation.
5	Meal, combat, individual.	4 packets (12 meals)	24.0	0.85	4.8	Designed for use as individual meal packets or in multiples of three for a complete ration. Not to be used over extended periods.
6	Trail, frigid, individual.	8 rations	34.0	1.60	4.0	Designed for use in extremely cold climates by small patrols or trail teams for short periods of time (1-3 days) under conditions where resupply is impossible.
7	Ration supplement, sundries pack (1 pack per 100 men).		47.0	1.90		Composed of items necessary to the health and comfort of troops; e.g., essential toilet articles, tobacco, and confections that normally are obtained at an exchange. Made available in theaters of operation for issue pending establishment of adequate exchange service facilities.
8	Ration supplement, aid station (makes 205 8-oz drinks).		20.0	1.10		Designed for use at forward medical aid stations to provide combat casualties with hot, stimulating beverages which alleviate shock and contribute to patient comfort.

5.7. Medical Service Unit Assemblages^{1 2}

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Construction combination and TOE number	Major medical equipment set and Federal stock number	Medical equipment set(s) ³						Other technical service equipment ¹						Total unit TOE assemblage ¹					
			Number of lines	Number of pack-ages	Short tons	Cube	Car-loads	Sq ft of storage space	Number of lines	Number of pack-ages	Short tons	Cube	Car-loads	Sq ft of storage space	Total number of lines	Total number of pack-ages	Total short tons	Total cube	Total car-loads	Total sq ft of storage space
2	SGT..... 8-500C	Gen disp, CommZ, type I..... 6545-925-2700	656	98	4.6	565	LCL	56	233	51	2.0	218	LCL	27	889	149	6.6	783	LCL	83
3	SGV..... 8-500C	Gen disp, CommZ, type II..... 6545-925-2800	596	170	6.6	852	LCL	85	84	45	2.0	90	LCL	11	680	215	8.6	942	LCL	96
4	SHH..... 8-500C	Disp, CommZ..... 6545-925-9010	388	65	2.4	349	LCL	35												
5	SGU ⁴ 8-510D	Fld hosp hospitalization unit, mbl..... 6545-543-6730	902	472	17.5	2,529	1	253												
6	SGE ⁵ 8-563D	Sta hosp, 100-bed, CommZ..... 6545-955-1830	1,882	478	32.2	4,417	2	450	388	397	22.8	3,023	1	320	2,220	875	55.0	7,440	3	770
7	SG3 ⁵ 8-564D	Sta hosp, 200-bed, CommZ..... (1 ea 6545-955-1830 and 6545-925-5330)	1,950	790	46.6	6,401	3	760	235	810	25.9	3,328	1	400	2,185	1,600	72.5	9,729	4	1,160
8	SG4 ⁵ 8-565D	Sta hosp, 300-bed, CommZ..... (1 ea 6545-925-5310 50-bed exp, CommZ) (1 ea 6545-955-1850 250-bed hosp, CommZ)	2,608	1,130	60.1	8,514	4	860	290	387	45.9	6,502	2	3,036	2,898	1,517	106.0	15,016	6	3,896
9	SGC ⁵ 8-566D	Sta hosp, 500-bed, CommZ..... 6545-955-1880	2,550	1,735	82.5	12,468	6	1,260	483	1,282	99.6	12,185	6	1,660	3,033	3,017	182.1	24,653	12	2,920
10	SGB ⁵ 8-567R	Sta hosp, 750-bed, CommZ..... 6545-955-1910	2,778	2,271	127.6	23,252	9	2,350	512	1,852	110.6	12,803	6	1,750	3,290	4,123	238.2	36,055	15	4,100
11	SGA ⁵ 8-551R	Gen hosp, 1,000-bed, CommZ..... 6545-925-3950	2,887	3,709	233.9	34,123	15	3,440	335	2,105	125.0	13,638	6	1,800	3,222	5,814	358.9	47,761	21	5,240
12	SGL ⁵ 8-563D	Hosp exp, 25-bed, CommZ..... 6545-925-5300	399		4.0	543	LCL	60												
13	SGK ⁵ 8-563D	Hosp, exp, 50-bed, CommZ..... 6545-925-5310	408	171	7.6	1,099	LCL	112												
14	SGJ ⁵ 8-564D	Hosp exp, 100-bed, CommZ..... 6545-925-5330	463	279	14.3	2,097	1	300												
15	SGI ⁵	Hosp exp, 250-bed, CommZ..... 6545-925-5350	445	658	31.3	4,927	2	500												
16	SGH.....	Hosp exp, 500-bed, CommZ..... 6545-925-5370	457	1,175	61.3	10,599	4	1,080												
17	SAJ..... 8-571R	Mbl army surg hosp, 60-bed..... 6545-931-4850	1,167	406	16.0	2,358	1	185	165	514	26.3	2,985	1	300	1,332	920	42.3	5,343	2	485
18	SGN..... 8-581R	Evac hosp, smbl, 400-bed..... 6545-919-5800	2,631	975	41.8	6,602	13	665	249	1,052	72.2	8,221	3	1,040	2,880	2,027	114.0	14,823	16	1,705
19	SGQ ⁵ 8-590D	Conv cen, army, exp 1,500 patients..... 6545-914-4285	507	481	21.4	2,604	1	265	170	2,706	138.2	12,612	6	1,500	1,002	4,881	159.6	15,216	7	1,765
20	SHB ⁵ 8-590D	Conv cen, army, 1,500 patients..... 6545-914-4295	970	814	32.1	4,463	2	450	495	4,400	260.0	31,400	13	4,000	1,140	3,520	292.1	35,863	15	4,450
21	SSJ..... 8-650D	Med lab, army..... 6545-664-0358	3,132	852	20.4	3,603	1	365												
22	SSH ⁴ 8-650D	Med lab, ptbl, army..... 6545-543-4111	1,848	249	9.0	1,329	1	144												

¹ Excludes vehicles and minimum essential equipment (AR 220-10).
² These data represent the unit assemblage components as packaged by the Army Medical Service depot for oversea shipment.
³ Includes only materiel items organic to the medical equipment set as published in the appropriate DA supply document pertaining to the Federal stock number specified in column 2.
⁴ Multiply by 3 for complete fld hosp.
⁵ No current documentation available; estimated, based on previous documentation.

1	1	2	3	4	5	6
	Type ration	Packaging information			Average weight per ration, including packing (lb)	Remarks
		Number rations per package (case)	Weight per package (lb) (case)	Volume per package (cu ft) (case)		
9	Food packet, individual, assault.	24 packets	29.0	1.10	1.1	It is packaged so that it may be carried by the individual; it is provided troops in the initial assault phase of combat, when food is required that is light-weight, highly palatable, and conveniently carried by the individual. The packet will not be utilized for other than the phase of battle for which intended, usually not to exceed 24-30 hours.
10	Food packet, survival, arctic, SA.	24 packets	34.0	0.70	1.5	Designed for survival kits carried aboard aircraft operating over arctic regions. May be issued as an item of personal equipment for military personnel participating in active operations, in addition to its primary use by the Air Force. Intended for emergency use only. Each packet contains food for one man for 1 day for survival in a cold environment.
11	Food packet, survival, ST.	24 packets	36.0	0.70	1.5	Designed to be carried in survival kits of aircraft operating over tropical regions. Packet may be issued as an item of personal equipment for military personnel engaged in active operations. Intended for emergency use only. Each food packet contains food for one man for 3 days or three men for 1 day in a tropical environment.

5.4. Time Elements in Class I Supply

While the figures shown in the following table are an approximate average for combat conditions, they should be used as a guide only when actual experience is lacking.

1	1	2	3
	Work	Daylight (min)	Dark (min)
2	Unload rations for one division at class I distributing point and prepare for distribution to battle groups or units of similar size.	100	125
3	Distribution of class I supplies to battle group or unit of similar size by higher echelon at one distributing point.	20	20
4	Distribution of class I supplies to separate battalion or unit of similar size by higher echelon.	15	15
5	Preparation of 1 day's class I supplies for issue at battle group or battalion class I distributing point.	30	45
6	Physical distribution by battle group or battalion supply agencies of 1 day's class I supplies (transfer of loads) to kitchen.	15	20
7	Unload kitchen equipment from trucks, set up, and be prepared to begin cooking (or vice versa).	20	20
8	Breakdown of subsistence into three meals at kitchen (breakdown accomplished by mess personnel).	15	20
9	Personnel to prepare, cook, and be ready to serve a hot meal, starting with a hot kitchen. (Issue of subsistence for cold noon meal included if hot meal being prepared is breakfast.)	120	150
10	Serving a hot meal to troops from a kitchen truck with majority of men being served at the truck.	45	60
11	Serving a hot meal to troops by means of carrying parties (when kitchen is located within a 1,000-yard radius of company).	90	120

Section III. CLASS II AND IV SUPPLY—DIMENSIONS AND WEIGHTS

5.5. Items of Chemical Equipment

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in)						
2	Clothing impregnating.	Impregnating outfit, clothing, fld, M3					1.7	0.027	0.04
3		Impregnating plant, clothing, M2A1						50.000	
4	Compressor	Compressor, reciprocating, power-driven, 7 CFM, M1A1.	72	36	43	18.0	65.0	0.800	1.40
5	Detection	Detector kit, cml agent, M9A2 ²	22	18	10	2.7	2.3	0.025	0.05
6		Detector kit, cml agent, M18 ²	19	14	11	1.9	1.7	0.022	0.04
7	Gas-particulate filter unit.	Filter unit, gas-particulate, elec-mtr driven or gas-eng driven, 300 CFM, ABC, M6.				9.1	37.0	0.300	0.90
8		Filter unit, gas-particulate, gas-eng driven, 200 CFM, M2A2.					54.0	0.600	1.40
9		Filter unit, gas-particulate, tk, 3-man, 12 CFM, M7A1.	39	15	18	5.0	6.0	0.070	0.14
10		Filter unit, gas-particulate, tk, 3-man, 12 CFM, M8A1.	39	15	18	5.0	6.0	0.070	0.14
11	Incendiary oil mixing.	Mixing and transfer unit, incendiary oil, M5.	111	49	53	38.0	108.0	1.100	2.70

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in)						
12	Irritant gas disperser.	Irritant gas disperser, skid-mtd, gas-eng driven, 5,000 CFM, M2.	69	44	49	20.0	84.6	0.400	2.10
13	Laboratory	Lab, cml, base, M2					1,356.0	11.000	33.90
14		Lab, cml, mbl, M3					145.0	1.600	3.60
15	Portable flame-thrower.	Firing kit, one-shot ptbl flamethrower, M2. ³	14	13	11	1.0	1.2	0.048	0.03
16		Flamethrower, ptbl, M2A1	34	25	19	6.0	9.4	0.055	0.24
17		Flamethrower, ptbl, M2A1-7					8.2	0.056	0.21
18		Flamethrower, ptbl, one-shot, M8 ⁴	40	13	11	3.6	3.3	0.039	0.08
19		Fuel-filling kit, flamethrower, M10A1	25	20	12	3.5	3.5	0.044	0.09
20		Svc kit, ptbl, flamethrower, M2A1	24	19	12	3.2	3.2	0.041	0.08
21		Svc kit, ptbl, flamethrower, M2A1-7					3.2	0.041	0.08
22	Protective	Breathing apparatus, compressed air, M15.					2.2	0.020	0.06
23		Mask, protective, fld, M9A1 ⁵	21	19	15	2.8	3.3	0.028	0.08
24		Mask, protective, fld, M17 ⁶	28	20	14	3.9	4.6	0.029	0.12
25	Shop equipment.	Maint and rep set, CmlC eqp, M1A1					104.0	1.300	2.60
26	Smoke generator.	Genr, smoke, mech, M2A1	43	30	33	9.0	25.0	0.016	0.63
27		Genr, smoke, mech, pulsc-jet, M3A2	51	24	29	9.0	20.0	0.110	0.50
28		Genr, smoke, mech, pulse-jet, M3A3	51	24	29	8.5	20.0	0.110	0.50
29	Trailer	Decon apparatus, power-driven, trl-mtd, M8A2.	154	69	80	74.0	492.0	1.680	12.30
30	Truck	Decon apparatus, power-driven, trk-mtd, M3A3,	261	87	105	158.0	1,380.0	7.100	34.50
31		Decon apparatus, power-driven, trk-mtd, M9.	261	87	105	158.0	1,380.0	7.100	34.50
32		Svc unit, flamethrower, trk-mtd, ABC, M4A1.					1,656.0		41.40
33		Svc unit, flamethrower, trk-mtd, M4	260	88	121	165.0	1,663.0	8.200	41.40
34	Water heater.	Heater, water, oil, skid-mtd, 600 GPM, M2.	58	22	43	8.9	32.0	0.475	0.80

¹ All items crated, except trucks.

² Packed 8 detector kits per box.

³ Packed 20 firing kits per box.

⁴ Packed 2 flamethrowers per box.

⁵ Packed 6 masks per box

⁶ Packed 10 masks per box.

5.6. Items of Engineer Equipment^{1 2 3 4 5}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in.)						
2	Boat.....	Boat, brg erection, gas-eng driven, aluminum, 19-ft long.	234	97	72	158	948	1.6	23.6
3	-----	Boat, brg erection, gas-eng driven, aluminum, 27-ft long.	324	96	80	216	1,440	2.9	36.0
4	Bridge.....	Brg, fxd, steel panel, Bailey-type, M2.....						125.0	175.0
5	-----	Brg, ftg, ft, aluminum.....						9.1	34.3
6	-----	Brg, ftg, M4.....						232.8	
7	-----	Brg, ftg, pneumatic, class 60, steel superstructure.						388.0	950.0
8	-----	Brg, ftg, highway, aluminum deck, balk superstructure, on pneumatic floats, M4T6.						92.5	205.0
9	-----	Brg erection set, ftg brg, W aluminum deck, balk superstructure.						2.0	4.4
10	Construction equipment.	Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu/hr.	102	66	62	47	241	1.0	6.0
11	-----	Auger, earth, skid-mtd, gas-eng driven, model HDM-S (TM 5-9132).	133	34	60	31	157	2.6	3.9
12	-----	Compressor, air, reciprocating, tlr-mtd, diesel-eng driven, 315 CFM, Joy model WK-80-315.	131	80	77	73	467	2.9	12.6
13	-----	Compressor, air, reciprocating, gas-eng driven, trk/skid-mtd, 80 CFM, 5,000 psi Clark model HO-6-OC1.	131	81	44	74	271	5.0	6.8
14	-----	Compressor, air, reciprocating, gas-eng driven, trk-mtd, 80 CFM, 5,000 psi, Joy model 80-HGC2-MS-1 and 80-HGC3-MS-1 (TM 5-4310-211-10).	144	81	65	81	439	3.7	11.0
15	-----	Compressor, air, reciprocating, tlr-mtd, 15 CFM, 3,500 psi, Joy model 15-HGP5-MS-1 (TM-5-4310-203-10).	82	68.5	40.8	39	133	1.0	3.3
16	-----	Compressor, air, rotary, wheel-mtd, diesel-eng driven, 600 CFM.	168	72	99	84	693	5.0	17.5
17	-----	Compressor, air, skid-mtd, gas-eng driven, 13 CFM, 3,500 psi, Rix model 1262 (TM 5-5398-1).	94.5	60	65	39	211	2.5	5.3
18	-----	Compressor, air, trk-mtd, gas-eng driven, reciprocating compressor, 210 CFM, LeRoi model 210G1 (TM 5-5065).	275	97	98	185	1,510	8.2	37.7
19	-----	Compressor, reciprocating, trk-mtd, W gas power unit, 80 CFM, air-cooled.	261	96	111	175	1,614	11.9	40.2
20	-----	Compressor, air, wheel-mtd, elec-mtr driven, AC, 220/440 v, 3 ph, 60 cy, 15 CFM, 3,500 psi, Davey model RPC-15 (TM 5-4310-214-10).	72	60	48	30	120	0.86	3.0
21	-----	Crane-shovel, basic unit, crawler-mtd, 10-ton cap, W 35-ft boom at 12-ft radius, ¾ cu yd, gas-eng driven, Koehring model 304.	176	116	130	142	1,536	17.0	39.9

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9
	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in.)						
22	Construction equipment—Continued.	Crane-shovel, basic unit, crawler-mtd, 40-ton cap, W 50-ft boom at 12-ft radius, 2 cu yd, diesel-eng driven, Baldwin-Lima-Hamilton model 802.	250	136	143	236	2,904	66.3	72.6
23	-----	Crane-shovel, basic unit, trk-mtd, 3-ton cap, W 25-ft boom at 10-ft radius, $\frac{3}{8}$ cu yd, 2 eng, gas-eng driven, 6 x 6; air-trans, ph II, Quick-way model N-383-AB.	258	93	122	167	1,695	9.2	42.4
24	-----	Crane-shovel, basic unit, trk-mtd, 20-ton cap, W 30-ft boom at 10-ft radius, $\frac{3}{4}$ cu yd, 2 eng, gas-eng driven, 6 x 6, Gar Wood model M-20-A (F).	339	109	150	256	3,207	28.5	80.2
25	-----	Crane-shovel, power unit, abn, $7\frac{1}{2}$ -ton, $\frac{1}{2}$ cu yd.	270	98	81	184	1,241	7.5	31.1
26	-----	Crane, tractor mounting, cen, revolving, $2\frac{1}{2}$ -ton lift at 7-ft radius, 12- to 18-ft telescopic boom, for tractor, full-tracked, low-speed.	144	72	96	72	576	9.5	14.4
27	-----	Crane, tractor, towed, 20-ton, 20-ft height of lift, wheeled, pneumatic tires, Le-Tourneau-Westinghouse model M-20.	331	111	118	256	2,509	5.7	62.7
28	-----	Crusher, air-trans, jaw-type, wheel-mtd, 15 tons/hr.	204	94	91	133	1,010	7.9	25.2
29	-----	Distributor, bituminous material, trk-mtd, 800-gal.	328	96	99	218	1,805	11.0	45.1
30	-----	Distributor, bituminous, tankless, tlr-mtd, W distributor attached.	120	84	86	70	501	2.1	12.5
31	-----	Distributor, water, tankless, tlr-mtd, W distributor attached.	180	78	73	98	592	1.1	14.8
32	-----	Distributor, water, trk-mtd, 1,000-gal.	304	91	103	192	1,648	10.6	41.2
33	-----	Ditching mach, ladder-type, crawler-mtd, 18-24 in. x 8 ft.	294	132	135	270	3,030	15.0	75.8
34	-----	Grader, road, mtz, diesel-eng driven, 7,000-8,975-lb DBP, 10-ft, air-trans.	263	82	84	149	1,050	7.3	26.3
35	-----	Grader, road, mtz, diesel-eng driven, tandem, 12,500-14,475-lb DBP, 12-ft.	300	94	91	196	1,482	11.7	37.1
36	-----	Grader, road, mtz, 4 x 4, diesel-eng driven, 14,500-18,000-lb, DBP, 13-ft.	291	95	104	192	1,664	11.0	41.6
37	-----	Grader, road, towed, leaning wheel, 12-ft moldboard.	382	118	96	312	2,500	6.2	62.6
38	-----	Heater, asphalt, tlr-mtd, 3-car cap, 42 HP.	190	66	79	87	573	2.5	14.3
39	-----	Kettle, asphalt, skid-mtd, gas-circulating pump, 750-gal.	152	82	53	87	384	3.3	9.6
40	-----	Loader, scoop-type, diesel-eng driven, 4-wheel, $1\frac{1}{2}$ cu yd.	209	84	81	122	825	7.9	20.6
41	-----	Loader, scoop-type, diesel-eng driven, 4-wheel, hyd front loading, vertical lift front dump, $2\frac{1}{2}$ cy yd, air-trans.	248	105	97	181	1,464	14.8	36.6
42	-----	Loader, scoop-type, rubber tires, tractor-mtd, hyd-op, $1\frac{1}{2}$ cu yd.	204	85	80	120	959	4.5	23.9

FM 101-10
PART I
5.6

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions-in.)						
43	Construction equipment—Continued.	Lubricating and svc unit, power-op, tlr-mtd, stor tk, 12 CFM.	166	83	78	96	622	3.7	15.5
44	-----	Mixer, concrete, gas-eng driven, end discharge, tlr-mtd, 16 cu ft.	115	98	127	78	828	2.9	20.7
45	-----	Powerplant, tlr-mtd, 5 kw	144	72	72	72	432	1.5	10.8
46	-----	Roller, road, gas-eng driven, 2-axle tandem, 5- to 8-ton.	177	63	86	77	555	6.6	13.9
47	-----	Roller, road, gas-eng driven, 3-axle, tandem, 9- to 14-ton.	268	63	87	117	850	9.5	21.3
48	-----	Roller, road, gas-eng driven, 3-wheel, 10-ton, W scarifier.	205	77	81	110	742	10.1	18.5
49	-----	Roller, road, towed, pneumatic tires, 4 tires, 85,000-lb cap.	298	96	92	198	1,522	7.4	38.1
50	-----	Roller, road, towed, sheepsfoot, 2 drums in line.	175	115	58	140	676	3.0	16.9
51	-----	Roller, road, towed, sheepsfoot, 3 drums in line.	139	180	54	174	784	4.2	19.5
52	-----	Roller, road, towed, wheeled, 13 pneumatic tires.	174	89	46	108	412	1.8	10.3
53	-----	Rooter, road, cable-op, 24 in. depth	240	98	108	163	1,470	3.8	36.8
54	-----	Scraper, road, towed, cable-op, 8 cu yd.	355	118	120	291	2,910	7.8	72.7
55	-----	Scraper, road, towed, cable-op, 12 cu yd.	376	137	130	357	3,880	10.2	96.9
56	-----	Slt, 60-in., W powerplant and con sta, trk-mtd.	280	96	140	186	2,180	9.3	54.4
57	-----	Stlr, tk, steel, 1,500-gal, W pump	216	96	90	144	1,080	3.6	27.0
58	-----	Tank, asphalt, stor, W steam coils and fittings, 4,000-gal.	234	96	109	156	1,416	5.0	35.4
59	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP, air-trans, ph I, W loader, scoop-type, hyd-op, 1 cu yd bucket (D-4).	174	73	72	88	528	8.3	13.2
60	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP, 60-in. min gage.	156	96	84	103	728	8.5	18.5
61	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 12,100-17,000-lb DBP, air-trans, ph I, W bulldozer (D-6).	190	95	73	125	764	11.4	19.1
62	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, W angledozer (D-7).	219	98	80	149	995	17.8	24.8
63	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, W angledozer, earth-moving, cable-op, rear mounting, 2-drum.	219	163	115	248	2,356	15.2	58.9
64	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, W angledozer, earth-moving, cable-op; W pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum.	223	154	82	238	1,618	17.7	40.4

1	1	2	3	4	5	6	7	8	9
			Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions-in.)						
65	Construction equipment— Continued.	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage, W bulldozer, earth-moving, cable-op; rigid inside track frame, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum.	208	105	115	152	1,444	17.2	36.1
66	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, 74-in. min gage.	163	98	79	111	731	12.8	18.0
67	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W angle-dozer (D-8).	240	104	90	174	1,300	20.0	32.5
68	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, 74-in. min gage, W bulldozer, earth-moving, cable-op, tilting, outside track frame, pneumatic cable, rear, 2 drums.	222	114	126	175	1,837	19.9	45.9
69	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W bulldozer, earth-moving, cable-op, tilting, outside track frame, pneumatic cable, front, 1 drum, rear, 2 drums.	230	136	95	217	1,714	23.5	42.8
70	-----	Tractor, full-tracked, low-speed, diesel-eng driven, 30,100-42,000-lb DBP, 78-in. min gage, W bulldozer, cable-op, tilting; W back ripper teeth, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum, International Harvester model TD-24.	249	140	101	243	2,038	27.6	50.9
71	-----	Tractor, full-tracked, low-speed, diesel-eng driven, hv DBP, 74-in. min gage, W bulldozer, cable-op, tilting, outside track frame, power con unit, cable-op, front, 1 drum; WWN, reversible, rear, 1 drum.	237	136	95	224	1,772	21.2	44.3
72	-----	Tractor, full-tracked, low-speed, diesel-eng driven, hv DBP, 74-in. min gage, mil spec T-12229, size 5, W bulldozer, cable-op, tilting, outside track frame, pneumatic cable, front, 1 drum; WWN, reversible, rear, 1 drum, Caterpillar model D-8.	241	136	90	228	1,707	24.1	42.6
73	-----	Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W angledozer, cable-op, front, 1 drum, power con unit, cable-op, rear, 2 drums, SAE mounting features, convertible to hyd-op.	202	113	95	159	1,255	19.8	31.1
74	-----	Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W bulldozer, cable-op, rigid outside track frame, power con unit, cable-op, rear, 2 drums.	205	116	87	165	1,197	14.8	29.9

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1	Class	Type or model	3	4	5	6	7	8	9
			Length	Width	Height	Sq ft	Cu ft	Short tons	Measurements
			(Dimensions-in.)						
75	Construction equipment—Continued.	Tractor, full-tracked, low-speed, diesel-eng driven, med DBP, 74-in. min gage, W angledozer, cable-op, W pneumatic cable, front, 1 drum; rear, 2 drums.	168	117	113	137	1,285	16.0	32.1
76	-----	Tractor, wheeled, ind, gas-eng driven, 5,200-7,775-lb, DBP.	108	66	75	49	310	3.0	7.8
77	-----	Tractor, wheeled, ind, diesel-eng driven, 14,025-20,000-lb DBP.	194	96	115	129	1,239	12.7	30.9
78	-----	Tractor, wheeled, ind, diesel-eng driven, 20,025-27,000-lb DBP.	221	136	106	285	1,850	15.7	46.1
79	-----	Tlr, bolster, 2½-ton, 1 swivel bolster	189	90	42.5	118	419	1.1	10.5
80	-----	Tlr, bolster, 2½-ton, 2 stationary bolsters inf raft and/or pneumatic brg egp.	189	90	65	118	640	1.1	16.0
81	-----	Tlr, bolster, 2½-ton, 2 stationary bolsters triangulation tower.	214	79	65	117	636	1.5	15.9
82	-----	Tlr, util, 2½-ton, 2-wheel	83	74	45	43	160	1.2	4.0
83	-----	Tlr, clamshell bucket, 3-ton	171	108	49	128	524	1.8	13.1
84	-----	Tlr, low-bed, 8-ton	288	100	55	200	918	4.8	22.9
85	-----	Tlr, flat-bed, 10-ton, for crane-shovel attachments.	333	98	60	227	1,135	5.6	28.3
86	-----	Tlr, low-bed, 60-ton	495	134	76	461	2,916	16.0	72.9
87	-----	Tlr-tractor, dump, diesel-eng driven, 13 cu yd.	445	115	129	356	3,820	16.0	95.8
88	-----	Trk, bolster body, 2½-ton, 6 x 6, WWN	268	87	96	162	1,291	5.7	32.4
89	-----	Trk, stake, 5-ton, WWN (mil bridging)	369	114	114	292	2,765	13.4	69.4
90	-----	Welding eqp, set No. 1, elec arc, tlr-mtd	143	72	69	72	412	1.8	10.3
91	Electric light	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 15 kw.	84	30	57	17	83	1.6	2.1
92	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 30 kw.	108	36	69	27	156	2.5	3.9
93	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 45 kw.	87	36	59	22	107	2.2	2.7
94	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 60 cy, 60 kw.	120	36	76	30	191	2.8	4.8
95	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, AC, 120-208/240-416 v, 60 cy 100 kw.	192	62	92		634		15.9
96	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 400 cy, 30 kw.	110	36	76	28	176	2.5	4.4
97	-----	Genr set, elec, ptbl, diesel-eng driven, skid-mtd, 120-208/240-416 v, 400 cy, 45 kw.	87	36	59	22	107	2.2	2.7
98	-----	Genr set, ptbl, gas-eng driven, skid-mtd, AC, 120 v, 1 and 3 ph, 120-240 v, 1 ph, 120-208 v, 3 ph, 60 cy, 10 kw.	64	28	42	12	42	0.7	1.1
99	-----	Genr set, ptbl, gas-eng driven, skid-mtd, AC, 120 v, 1 ph, 60 cy, 15 kw.	84	30	57	17.5	83	1.6	2.1
100	-----	Light set, gen illumination, set No. 3, 3 kw	90	36	38	23	71	1.0	1.8
101	-----	Light set, gen illumination, set No. 4, 5 kw	120	48	56	40	187	1.5	4.7
102	-----	Light set, gen illumination, set No. 5, 15 kw						5.5	23.5
103	Ferry	Const outfit, raft, set No. 1, inf spt						4.8	20.3
104	-----	Ferry conversion set, raft, inf spt						1.5	7.8

1	Class	2 Type or model	3	4	5	6	7	8	9
			Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in.)						
105	Fire-fighting equipment.	Fire-fighting eqp set, W tlr, GM.....	162	80	77	90	577	3.2	14.5
106		Fire-fighting eqp set, W trk, GM.....	336	96	108	224	2,020	18.5	50.4
107		Fire-fighting eqp set, W trk, set No. 18, 500 GPM.	270	96	111	180	1,667	11.3	41.6
108	Plant.....	Fire-fighting eqp set, W trk, set No. 21, Army acft crash.	294	96	106	196	1,740	10.5	44.0
109		Crushing, screening, and washing plant, 50 tons/hr.	480	124	144	414	4,960	32.0	124.0
110		Dryer, agg, tlr-mtd, 30 tons/hr max.....	246	108	127	185	1,960	6.0	48.8
111		Genr and chg plant, liq-oxy and nitro-gen, stlr-mtd, 5 tons/day liq-oxy and 200 lb/day liq-nitrogen, Air Products model LEON-5:							
		Air sep tlr.....	420	98	138	280	3,280	25.0	82.0
		Air source tlr.....	426	100	136	280	3,280	29.0	82.0
112		Genr and chg plant, liq-oxy and nitrogen, stlr-mtd, 20 tons/day oxy, Air Products model LEON-20:							
		Air sep tlr.....	420	98	138	280	3,280	22.0	82.0
		Air source tlr (2 ea).....	366	96	134	240	2,640	25.5	66.0
		Heat exch tlr.....	420	98	138	280	3,280	24.0	82.0
113	Shop equipment.	Mixer, bituminous, tlr-mtd, 10-30 tons/hr.....	180	102	120	128	1,275	5.5	31.9
114		Powerplant, nuclear, fxd, 2,000 kw, elec ⁶ 7.						640.0	
115		Solidifying plant, liq carbon-dioxide to dry ice, stlr-mtd, Electrical Heating Equipment Company model SCO2.	312	96	138	208	2,288	16.0	57.2
116		Shop eqp, contact maint, trk-mtd.....	214	83	89	123	914	2.5	22.9
117		Shop eqp, elec rep, stlr-mtd, set No. 4.....	324	97	129	218	2,342	11.8	58.7
118		Shop eqp, GP, hv, stlr-mtd, set No. 1.....	307	96	112	204	1,905	11.3	47.8
119		Shop eqp, org rep, lt, trk-mtd, set No. 2.....	318	94	129	208	2,228	11.0	55.8
120		Shop eqp, welding, set No. 8.....	80	42	41	23	80	3.9	2.0
121		Woodworking shop eqp, base maint, set No. 1.	145	72	46	72	278	1.9	6.9
122		Drafting eqp set (photomapping co, topo bn).					1,940	13.8	
123	Topographic equipment.	Map distr set, dep.....					3,615	29.0	
124		Map distr, set, ptbl.....					230	2.2	
125		Photomapping eqp, set No. 1 (topo bn, fld army).					1,970	15.1	44.4
126		Photomapping eqp, set No. 3 (topo co, corps).					261	2.2	6.5
127		Photoprinting and proc topo repro set, trk-mtd, set No. 3.	327	96	132	218	2,400	10.5	60.0
128		Repro eqp, topo, mtz, camera sec, set No. 7..	327	96	132	218	2,400	11.6	60.0
129		Repro eqp, topo, mtz, lab sec, set No. 3....	327	96	132	218	2,400	9.2	60.0
130		Repro eqp, topo, mtz, map layout sec, set No. 2.	327	96	132	218	2,400	10.7	60.0

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	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions-in.)						
131	Topographic equipment—Continued.	Repro eqp, topo, mtz, plate grainer sec, set No. 3.	327	96	132	218	2,400	10.2	60.0
132	-----	Repro eqp, topo, mtz, plate proc sec, set No. 3.	327	96	132	218	2,400	9.5	60.0
133	-----	Repro eqp, topo, mtz, press sec, set No. 7.	327	96	132	218	2,400	11.6	60.0
134	-----	Sv eqp, set No. 15 (topo co, corps)	-----	-----	-----	-----	385.7	2.6	-----
135	-----	Tower erection set, topo, W tower	-----	-----	-----	-----	-----	7.5	11.4
136	Water purification equipment.	Water purification eqp set, tlr-mtd, 600 GPH.	173	91	84	109	760	2.9	19.0
137	-----	Water purification eqp set, diatomite filter, ptbl, set No. 3, 35 GPM.	171	75	67	89	498	3.6	12.3
138	-----	Water purification eqp set, diatomite filter, ptbl, set No. 4, 50 GPM.	24	24	48	4	16	2.9	0.4
139	Miscellaneous.	Conversion and stor unit, carbon-dioxide, stlr-mtd, Cardox Corp model FE-34365.	324	98	126	270	2,160	8.5	54.0
140	-----	Fire and salv eqp, marine, set No. 1	-----	-----	-----	-----	-----	22.7	65.8
141	-----	Genr, acetylene, stlr-mtd, Sight Feed model TM CP-750.	354	99	133	244	2,684	11.0	66.8
142	-----	Genr, carbon-dioxide, stlr-mtd, Girdler model 32-4027.	420	110	138	306	3,690	24.0	92.0
143	-----	Genr, oxy-nitrogen, stlr-mtd, Air Products model A-2.	264	96	144	176	2,112	12.5	52.8
144	-----	Intrenching eqp, set No. 2	-----	-----	-----	-----	-----	2.3	6.3
145	-----	Pneumatic tool and compressor outfit, tlr-mtd, 210 CFM.	-----	-----	-----	73	467	2.9	-----
146	-----	Pneumatic tool outfit, 315 CFM	-----	-----	-----	-----	-----	1.2	3.2
147	-----	Tank, stor, liq-oxy, stlr-mtd, 9-ton cap, Cambridge model 217-30.	280	98	134	184	2,024	8.0	50.6
148	-----	Tank, stor, liq-oxy, skid-mtd, 35-ton cap, Cambridge model 845-20A-TF.	420	96	100	280	2,520	16.0	63.0
149	-----	Water cooling tower, stlr-mtd, Badger model CT-1.	348	96	135	232	2,552	9.0	63.7

¹ Items exceeding 1 short ton, uncrated.

² Dimensions shown in columns 3, 4, and 5 are the maximum length, width, and height in inches of fully assembled equipment in travel position.

³ Weights of vehicles shown in column 8 are for vehicles not loaded.

⁴ Measurement tons represent the volume of the fully assembled item; i.e., the product of columns 3, 4, and 5 in cubic feet divided by 40.

⁵ For classified data, see FM 101-10, part III, paragraph 5.8.

⁶ Capacity can be divided between electric power and heat; i.e., 1,300 kw electrical plus 3,500 kw equivalent of heat.

⁷ Essential powerplant components and buildings can be transported in 46 C-124 aircraft (2,100 miles range). The following materials are assumed to be available at the site—foundation materials, concrete aggregate, and earth suitable for shielding.

5.8. Items of Ordnance Equipment^{1 2 3}

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in.)						
2	ADA missile system, HAWK.	Launcher, GM/HAWK	175	96	92	117	900	2.1	22.5
3	ADA missile system, NIKE-AJAX.	Launcher-loader, GM/NIKE-AJAX	243	79	57	133	635	1.8	15.9
4	ADA missile system, NIKE-HERCULES.	Launcher-loader, GM/NIKE-HERCULES.	275	97	38	185	587	6.3	14.7
5	Bulldozer	Bulldozer, earth-moving, tractor mounting, M5.		130	35	31	189	2.0	
6		Bulldozer, earth-moving, tk mounting, M8.		146	36	36	240	4.4	
7	Dolly	Dolly, tlr converter, 6-ton, 2-wheel, M197A1.	112	93	52	72	313	1.5	7.8
8		Dolly, tlr converter, 8-ton, 2-wheel M198A1.	119	97	56	80	374	1.7	9.3
9		Dolly, tlr converter, 18-ton, 4-wheel, M199.	150	115	58	80	587	4.0	9.3
10	HONEST JOHN rocket system.	Handling unit, 762-mm rkt, tlr-mtd, M405.	321	97	130	216	1,408	4.3	35.2
11		Launcher, 762-mm rkt, trk-mtd, M386.	389	114	105	308	2,677	16.8	67.0
12		Launcher, 762-mm rkt, XM33.	346	94	54	226	1,016	2.3	25.4
13		Tlr, 762-mm rkt, 4-wheel, XM465.	316	83	61	184	936	2.2	3.4
14	Rifle	Rifle, 106-mm, on mount, M79.	135	32	44	30	110	0.2	2.8
				(base arms closed)					
15	Semi-trailer	Stlr, cgo van, 6-ton, 2-wheel, M119.	264	90	78	165	2,026	3.6	43.0
16		Stlr, shop van, 6-ton, 2-wheel, M146.	276	95	136	182	2,064	3.8	51.6
17		Stlr, stake, 6-ton, 2-wheel, M118.	276	95	103	182	1,563	3.1	39.0
18		Stlr, cgo, 12-ton, 4-wheel, M127A1.	344	97	106	231	2,100	6.8	51.2
19		Stlr, sup van, 12-ton, 4-wheel, M129.	346	98	143	235	2,806	7.7	70.1
20		Stlr, low-bed, 15-ton, 4-wheel, M172.	406	115	64	324	1,729	7.8	43.2
21		Stlr, tk, gas, 5,000-gal, 4-wheel M131A2.	361	96	106	241	2,292	6.4	53.1
22		Stlr, tk transporter, 50-ton, 8-wheel, M15A2.	473	150	68	492	3,490	21.3	69.7
23	Trailer	Tlr, cgo, 1/4-ton, 2-wheel, M100.	109	56	42	42	148	0.2	3.7
24		Tlr, cgo, 3/4-ton, 2-wheel, M101.	147	73	83	75	520	0.7	13.0
25		Tlr, tk, water, 400-gal, 2-wheel, M149.	157	80	73	94	572	1.3	14.3
26	Tracked vehicle.	Carrier, cgo, amph, full-tracked, M29.	126	66	71	58	219	1.8	8.5
27		Carrier, cgo, amph, full-tracked, M29C.	192	67	71	90	403	2.3	13.2
28		Carrier, cgo, amph, full-tracked, M76.	215	98	103	146	1,180	6.1	31.4
29		Carrier, pers, full-tracked, armd, M59.	215	129	88	198	1,670	19.4	36.3
30		Carrier, pers, full-tracked, armd, M113.	189	106	87	139	1,008	11.2	
31		Gun, twin 40-mm, SP, full-tracked, M42A1.	244	129	111	218	1,900	21.5	47.5

See footnotes at end of table.

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	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
			(Dimensions-in.)						
32	Tracked vehicle—Continued.	Gun, 90-mm, SP, full-tracked, M56 (abn) . .	242	98	87	165	1,026	6.5	29.9
33		Howitzer, 105-mm, SP, full-tracked, M52A1,	215	128	134	191	1,890	25.0	53.6
34		Howitzer, 155-mm, SP, full-tracked, M44A1.	240	128	122	214	2,240	27.5	54.6
35		Howitzer, 8-in., SP, full-tracked, M55-----	325	140	140	316	2,101	48.0	92.7
36		Mortar, 4.2-in., SP, full-tracked, M84-----	215	129	88	198	1,670	19.4	36.3
37		Tk, cmbt, full-tracked, lt gun, M41A3-----	264	130	111	238	2,205	25.4	56.9
38		Tk, cmbt, full-tracked, med gun, M48A2-----	289	146	115	293	2,982	49.5	68.4
39		Tk, cmbt, full-tracked, med gun, M60-----	328	143	118	326	3,203	42.7	79.5
40		Tk, cmbt, full-tracked, 120-mm gun, M103A1.	398	146	127	405	4,290	62.8	104.0
41		Tk recovery vehicle, hv, M51-----	399	143	129	396	4,260	49.3	106.4
42		Tk recovery vehicle, med, M74-----	330	122	133	279	2,611	44.3	76.9
43		Tk recovery vehicle, med, M88-----	318	135	120	298	2,700	54.4	74.5
44		Tractor, full-tracked, high-speed, M8A2-----	265	131	120	242	2,418	19.3	60.3
45		Tractor, full-tracked, high-speed, 23-ton, M85.	239	119	129	197	1,735	16.9	53.1
46		Tractor, full-tracked, high-speed, 38-ton, M6.	258	121	104	217	2,166	30.0	45.5
47	Weapon (towed).	Gun, 280-mm, hv mtz, M65-----	1,010	124	146	871	10,590	76.0	264.5
48		Howitzer, 105-mm, M2A2 (carriage, M2A2).	236	82	66	135	302	3.3	18.5
49		Howitzer, 155-mm, M1A1 (carriage, M1A2).	288	96	81	191	834	8.7	32.4
50		Howitzer, 8-in., M2A1 (carriage, M1)-----	480	99	103	330	2,683	16.8	70.8
51		Launcher, multiple rkt, 4.5-in., M21-----	179	80	57	99	470	0.8	11.8
52	Wheeled vehicle (less trailer).	Automobile, sedan, lt-----	197	74	66	101	557	1.7	14.0
53		Automobile, sedan, med-----	207	76	63	109	575	1.8	14.4
54		Carrier, lt wpn, inf, ½-ton, 4 x 4, M274-----	104	47	28	32	77	0.4	2.0
55		Trk, amb, frontline, ¼-ton, 4 x 4, M170-----	155	61	57	136	407	1.5	6.6
56		Trk, util, ¼-ton, 4 x 4, M38A1-----	139	61	57	60	274	1.3	6.6
57		Trk, util, ¼-ton, 4 x 4, M151-----	132	63	71	58	245	1.2	8.5
58		Trk, ¾-ton, 6 x 6, XM408-----	162	62	72	72	432	1.2	10.8
59		Trk, amb, fld, ¾-ton, 4 x 4, M43-----	198	74	92	102	813	3.6	19.7
60		Trk, ego, ¾-ton, 4 x 4, M37-----	189	74	90	97	497	3.0	18.4
61		Trk, wkr, ¾-ton, 6 x 6, XM408-----	186	63	73	81	496	1.6	12.4
62		Trk, amph, 2½-ton, 6 x 6, M147E2-----	382	104	115	271	2,483	9.6	66.0
63		Trk, ego, 2½-ton, 6 x 6, M34-----	275	88	109	168	1,094	6.0	38.0
64		Trk, ego, 2½-ton, 6 x 6, M211-----	269	96	112	179	1,270	6.8	41.8
65		Trk, ego, 2½-ton, 6 x 6, XLWB, M41-----	294	97	111	198	1,830	9.9	45.7
66		Trk, crane, 2½-ton, 6 x 6, M108-----	303	96	99	200	1,655	9.9	41.7
67		Trk, dump, 2½-ton, 6 x 6, M342-----	273	96	101	182	1,244	7.7	38.3
68		Trk, lt wkr, 2½-ton, 6 x 6, M60-----	302	96	107	201	1,787	11.9	44.9
69		Trk, shop van, 2½-ton, 6 x 6, M220-----	269	96	130	179	1,943	7.5	48.6
70		Trk, shop van, 2½-ton, 6 x 6, M292-----	329	98	133	224	2,482	9.7	62.5

	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions—in.)						
71	Wheeled vehicle (less trailer)—Continued.	Trk, tk, gas, 2½-ton, 6 x 6, M217-----	267	96	109	178	1,335	7.1	40.4
72		Trk, tk, water, 2½-ton, 6 x 6, M222-----	267	96	103	178	1,335	7.2	38.2
73		Trk, tractor, 2½-ton, 6 x 6, M48-----	240	93	82	155	1,118	5.9	28.0
74		Trk, tractor, 2½-ton, 6 x 6, M221-----	232	96	102	155	1,015	6.0	32.9
75		Trk, cgo, 5-ton, 6 x 6, M41-----	311	98	111	212	1,958	9.9	48.9
76		Trk, dump, 5-ton, 6 x 6, M51-----	282	97	111	190	1,318	11.0	43.9
77		Trk, med wkr, 5-ton, 6 x 6, M62-----	348	97	128	233	1,919	16.7	62.1
78		Trk, tractor, 5-ton, 6 x 6, M52-----	257	96	102	173	1,245	9.2	36.8
79		Trk, tractor, wkr, 5-ton, 6 x 6, M246-----	352	98	132	240	2,635	16.4	65.9
80		Trk, cgo-prime mover, 10-ton, 6 x 6, M125--	334	115	130	266	1,911	18.0	72.2
81		Trk, tractor, 10-ton, 6 x 6, M123-----	380	114	112	222	2,068	14.5	51.7
82		Trk, gun-lifting, hv, 4 x 4, front, M249----	368	124	120	317	3,170	16.6	79.1
83		Trk, gun-lifting, hv, 4 x 4, rear, M250-----	369	124	120	318	3,313	17.7	79.3

¹ Items exceeding 1 short ton, uncrated.

² Weights shown in column 8 for combat vehicles, except half-tracks, are fighting (loaded) weights. Those for half-tracks and noncombat vehicles are weights of vehicles not loaded.

³ For classified data pertaining to nuclear weapons systems, see FM 101-10, part III, chapter 5.

5.9. Items of Quartermaster Equipment^{1 2}

1	1	2	3	4	5	6	7	8	9
	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions-in.)						
2	Crane.....	Crane, trk, whs, sluing boom, gas, front-wheel drive, pneumatic tires, 10,000-lb cap.	295	94	95	199	1,584	10.4	39.6
3	Semi-trailer...	Petrl lab, mbl.....	300	96	118	200	1,968	9.5	49.2
4	.....	Stlr, refrg, 7½-ton, 2-wheel, lt-weight.....	246	83	129	142	1,525	3.2	38.5
5	Tractor.....	Tractor, wheeled, whs, gas, 4 pneumatic-tired wheels, 4,000-lb cap.	110	65.5	56	54	258	2.4	6.5
6	Trailer.....	Bath unit, fld, mbl.....	151	72	68	76	428	2.1	10.6
7	.....	Bath unit, fld, ptbl, 8-showerhead, M58.....	77	39.5	46	22	82	0.4	2.1
8	.....	Bkry unit, mbl, M1945: Genr set, gas-eng driven, wheel-mtd, 30 kw.	150	71	96	74	592	2.4	14.8
9	.....	Mixing and makeup machinery tlr.....	197	88	111	121	1,113	5.5	27.8
10	.....	Oven tlr.....	200	88	83	122	847	3.3	21.1
		Ldry unit, mbl, two-trl type, M1955:							
11	.....	Tumbler tlr.....	164	84	90	96	716	2.5	17.9
12	.....	Washer tlr.....	164	84	84	96	670	2.5	16.7
		Rclm and maint:							
13	.....	Clo rep tlr.....	108	67	66	50	276	2.2	6.9
14		Shoe rep tlr.....	108	67	66	50	276	2.4	6.9
15		Textile rep tlr.....	108	67	66	50	276	2.2	6.9

See footnotes at end of table.

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	1	2	3	4	5	6	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Meas- urement tons
			(Dimensions-in.)						
16	-----	Tlr, platform, whs, wood, 6,000-lb cap, pneumatic tires, 48 x 108 in.	108	48	21	36	76	0.5	1.2
17	Truck-----	Trk, lift, fork, gas, 2,000-lb, solid rubber tires, 130-in. lift.	69	33	83	16	126	2.3	3.1
18	-----	Trk, lift, fork, gas, 4,000-lb, solid rubber tires, 100-in. lift.	77.8	41	91	22	174	3.4	4.4
19	-----	Trk, lift, fork, gas, 6,000-lb, pneumatic tires, 168-in. lift.	113	68	115	55	552	5.2	13.8
20	-----	Trk, lift, fork, gas, 6,000-lb, pneumatic tires, rough terrain.	204	86	91	122	868	8.5	21.7
21	-----	Trk, lift, fork, gas, 10,000-lb, pneumatic tires, 210-in. lift.	136	77	150	78	976	7.1	24.4
22	-----	Trk, lift, fork, gas, 10,000-lb, 4 steerable drive wheels, pneumatic tires, rough terrain.	240	103	100	172	-----	13.7	35.9
23	-----	Trk, lift, fork, gas, 15,000-lb, pneumatic tires, 210-in. lift.	152	96	150	101	1,356	9.2	33.9

¹ Items exceeding 1 short ton, uncrated.

² Weights of vehicles shown in column 8 are weights of vehicles *not* loaded.

5.10. Items of Signal Equipment¹

1	1	2	3	4	5	6	7	8
	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
		(Dimensions—in.)						
2	Amplifier, AM-364/U-----	22.25	11.00	20.13	1.70	2.80	0.019	0.07
3	Amplifier, power sup, AM-598/U-----	13.00	10.25	12.25	0.93	0.94	0.018	0.027
4	Antenna, AT-339/PRC-----	9.50	0.38	0.38	0.36	0.21	0.00137	0.00525
5	Attenuator, TS-402/U-----	8.75	6.00	7.00	0.36	0.22	0.0045	0.00525
6	Axle, RL-27-----	24.00	1.75	1.75	0.36	0.12	0.00275	0.00525
7	Battery, BA-2-----	3.44	2.03	2.59	-----	0.01	0.000625	0.00025
8	Battery, BA-8-----	6.56	4.00	3.00	-----	0.04	0.00225	0.001
9	Battery, BA-15A-----	2.22	1.31	4.00	-----	0.01	0.0004	0.00025
10	Battery, BA-23-----	2.56	2.56	6.56	-----	0.02	0.0019	0.0005
11	Battery, BA-27-----	4.00	1.44	3.56	-----	0.02	0.0005	0.0005
12	Battery, BA-30-----	1.31	1.31	2.38	-----	0.01	0.000125	0.00025
13	Battery, BA-31-----	2.44	0.81	3.16	-----	0.01	0.00019	0.00025
14	Battery, BA-34-----	4.06	0.88	3.31	-----	0.01	0.000365	0.00025
15	Battery, BA-35-----	2.63	2.63	4.50	-----	0.02	0.00075	0.0005
16	Battery, BA-36-----	4.19	2.50	6.53	-----	0.04	0.00169	0.001
17	Battery, BA-40-----	5.25	4.09	7.38	-----	0.08	0.003875	0.002
18	Battery, BA-51-----	2.69	1.31	3.69	-----	0.01	0.00044	0.00025
19	Battery, BA-63-----	2.94	2.25	4.06	-----	0.02	0.00075	0.0005
20	Battery, BA-65-----	2.63	2.63	4.00	-----	0.02	0.00069	0.0005
21	Battery, BA-202/UF-----	2.38	1.31	1.31	-----	0.01	0.000125	0.00025
22	Battery, BA-205/U-----	4.59	2.63	1.31	-----	0.01	0.00044	0.00025

¹ All weights and dimensions export pack, except for vehicular-mounted sets.

1	2	3	4	5	6	7	8
	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
	(Dimensions—in.)						
Type or model							
23 Battery, BA-210/U.....	4.00	2.63	2.63	-----	0.02	0.00075	0.0005
24 Battery, BA-261/U.....	0.63	1.00	1.94	-----	0.01	0.000665	0.00025
25 Battery, BA-402/U.....	1.38	2.63	4.50	-----	0.01	0.00047	0.00025
26 Battery, BA-403/U.....	1.38	3.94	4.50	-----	0.01	0.000595	0.00025
27 Battery, BA-404/U.....	2.63	2.63	4.50	-----	0.02	0.000815	0.0005
28 Battery, BA-405/U.....	3.94	2.63	4.50	-----	0.03	0.00119	0.00075
29 Battery, BA-409/U.....	2.63	2.63	4.50	-----	0.02	0.000815	0.0005
30 Battery, BA-412/U.....	3.88	7.81	6.00	-----	0.11	0.004875	0.00275
31 Battery, BA-414/U.....	1.44	2.94	3.25	-----	0.01	0.000345	0.00025
32 Battery, BA-415/U.....	1.44	5.38	3.25	-----	0.02	0.00069	0.0005
33 Battery, BA-416/U.....	2.88	4.13	3.25	-----	0.02	0.001	0.0005
34 Battery, BA-419/U.....	2.31	7.63	4.13	-----	0.04	0.00203	0.001
35 Battery, BA-1264/U.....	2.69	3.50	6.25	-----	0.03	0.001125	0.00075
36 Battery, BA-1277/U.....	1.31	2.44	4.19	-----	0.01	0.00069	0.00025
37 Battery, BA-1278/U.....	1.31	3.19	4.19	-----	0.01	0.00069	0.00025
38 Beacon, AN/CVX-1.....	52.25	27.00	15.25	9.80	1.00	0.023	0.025
39 Camera set, KS-5.....	21.00	18.00	15.00	2.55	3.50	0.0255	0.0875
40 Camera set, KS-6.....	19.00	22.50	11.00	2.97	2.62	0.018	0.0655
41 Camera, still picture, KS-4.....					7.50	0.05	0.1875
42 Central office, telephone manual, AN/ MTC-1 (mtd on 2 ea trk, 2½-ton, 6x6, WWN).....					4,674.00	18.61	116.70
43 Central office, telephone manual, AN/ MTC-3 (mtd on trk, 2½-ton, 6x6, WWN).....					2,732.00	9.63	68.30
44 (Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.00	7.58	48.50
45 (Shelter, S-141 (eqp instl) (dsmtl))..	141.00	81.00	80.00	-----	529.00	1.14	13.20
46 (Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00	-----	781.60	2.05	19.70
47 Central office, telephone manual, AN/ MTC-7 (mtd on trk, ¾-ton, 4x4, WWN).....					1,243.00	4.58	31.00
48 (Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN)).....	190.00	73.00	90.00	-----	723.00	3.61	18.30
49 (Shelter, S-144 (eqp instl) (dsmtl))..	74.00	57.00	61.00	-----	149.00	0.64	3.70
50 (Genr set, PU-322/G, tlr-mtd).....	147.00	74.00	83.00	-----	522.80	0.97	13.00
51 Central office, teletypewriter, AN/MGC- 9 (mtd on trk, 2½-ton, 6x6, WWN).....					2,732.00	9.57	68.30
52 (Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.00	7.51	48.50
53 (Shelter, S-141 (eqp instl) (dsmtl))..	141.00	81.00	80.00	-----	529.00	1.07	13.20
54 (Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00	-----	781.60	2.05	19.70
55 Central office, teletypewriter, AN/ MGC-17 (mtd on trk, ¾-ton, 4x4, WWN).....					1,243.00	4.81	31.00
56 (Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN)).....	190.00	73.00	90.00	-----	723.00	3.61	18.30
57 (Shelter, S-144 (eqp instl) (dsmtl))..	74.00	57.00	61.00	-----	149.00	0.64	3.70
58 (Genr set, PU-322/G, tlr-mtd).....	147.00	74.00	83.00	-----	522.80	0.97	13.00
59 Channel alinement indicator, ID-292/ PRC-6.....					0.07	0.00175	0.00102

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	1	2	3	4	5	6	7	8
1	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
		(Dimensions—in.)						
60	Charger, battery, PP-775/U, W 5-kw genr set, tlr-mtd.....	166.00	83.00	98.00	-----	781.60	1.94	19.50
61	Chest, BC-5.....	23.88	18.88	12.00	3.67	3.78	0.0175	0.0945
62	Climbers, LC-240/U.....	-----	-----	-----	-----	0.30	0.0075	0.00175
63	Code training set, AN/GSC-T1.....	-----	-----	-----	-----	6.79	0.0585	0.16975
64	Coil, C-161.....	-----	-----	-----	-----	0.21	0.003	0.0055
65	Comm op cen, AN/MSC-31 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	1,942.00	8.19	48.50
66	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.00	8.19	48.50
67	(Shelter, S-141 (eqp instl) (dsmtld)).....	141.00	81.00	80.00	-----	529.00	1.75	13.20
68	Detector set, AN/PRS-3.....	-----	-----	-----	-----	1.50	0.019	0.0375
69	Direction finding set, AN/TRD-10 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	2,769.00	10.20	69.20
70	(Shelter, S-144 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	133.00	-----	1,988.00	9.09	49.70
71	(Shelter, S-144 (eqp instl) (dsmtld)).....	139.00	74.00	85.00	-----	505.00	1.60	12.60
72	(Genr set, PU-290/U, tlr-mtd).....	166.00	83.00	98.00	-----	781.60	2.08	19.50
73	Dryer, photo print, PH-679/U.....	40.00	25.00	37.00	7.00	21.50	0.1025	0.575
74	Electronic multimeter, TS-505/U.....	13.00	13.00	11.25	1.17	1.01	0.0115	0.02525
75	Emergency switchboard, SB-18/GT.....	-----	-----	-----	-----	1.00	0.007	0.025
76	Exposure meter, PH-260.....	-----	-----	-----	-----	0.03	0.00075	0.00055
77	Film rep eqp, PH-206.....	40.00	10.00	30.00	2.78	1.50	0.0065	0.0375
78	Flashlight, MX-212/U.....	-----	-----	-----	-----	0.04	0.000355	0.001
79	Flashlight, MX-991/U.....	-----	-----	-----	-----	0.04	0.0005	0.001
80	Frequency meter, AN/URM-32.....	13.38	11.25	14.50	1.04	1.20	0.026	0.03
81	Genr set, gas-eng driven, PU-290/MR, tlr-mtd.....	166.00	83.00	98.00	-----	781.60	2.08	19.50
82	Genr set, gas-eng driven, PU-294/G, tlr-mtd.....	166.00	83.00	98.00	-----	781.60	2.05	19.50
83	(2 ea power units, PU-286/G (dsmtld)).....	44.00	22.00	31.00	-----	17.63	0.38	0.44
84	(1 ea tlr, cgo, 1½-ton, 2-wheel).....	166.00	83.00	98.00	-----	781.60	1.32	19.50
85	Genr set, gas-eng driven, PU-322/G, tlr-mtd.....	-----	-----	-----	-----	520.00	0.97	13.00
86	(2 ea power units, PE-75 (dsmtld)).....	-----	-----	-----	-----	19.00	0.29	0.47
87	(1 ea tlr, cgo, ¾-ton, 2-wheel).....	147.00	74.00	83.00	-----	522.80	0.67	13.00
88	Ground rod, MX-148/G.....	6.00	1.25	1.25	-----	-----	0.002	-----
89	Indicator, panoramic, IP-173/U.....	25.00	28.00	41.00	0.49	8.48	0.0945	0.212
90	Lab, darkroom, AN/TFQ-7.....	150.00	80.00	88.00	83.30	612.00	3.135	15.60
91	Lab, darkroom, AN/TFQ-7 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	2,459.00	10.11	61.47
92	(Shelter, S-56 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	103.00	-----	1,942.13	8.08	48.50
93	(Shelter, S-56 (eqp instl) (dsmtld)).....	139.00	81.00	80.00	-----	521.43	1.64	13.00
94	(Genr set, PU-256/U, tlr-mtd).....	144.00	69.00	90.00	-----	517.86	2.02	12.90
95	Lamp eqp, PH-218.....	-----	-----	-----	-----	6.50	0.034	0.1625
96	Meteorological station manual, AN/TMP-4.....	-----	-----	-----	-----	39.70	0.435	0.9925
97	Operations central, AN/MSC-32 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	1,942.00	7.35	48.50

1	1	2	3	4	5	6	7	8
	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
	(Dimensions—in.)							
98	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.00	7.35	48.50
99	(Shelter, S-141 (eqp instl) (dsmtl))..	141.00	81.00	80.00	-----	529.00	0.90	13.20
100	Oscilloscope, OS-8/U.....	20.25	11.13	14.75	1.60	1.35	0.017	0.03375
101	Output meter, TS-585/U.....	18.00	12.25	12.25	1.53	1.563	0.008	0.039075
102	Panel, patching, comm, SB-611/MRC (mtd on trk, ¾-ton, 4x4, WWN).....	-----	-----	-----	-----	723.00	3.79	18.30
103	(Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN)).....	190.00	73.00	90.00	-----	723.00	3.49	18.30
104	(Shelter, S-144 (eqp instl) (dsmtl))..	74.00	57.00	61.00	-----	149.00	0.82	3.70
105	Panel, patching, comm, SB-675/MS (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	1,942.00	7.74	48.50
106	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.00	7.74	48.50
107	(Shelter, S-141 (eqp instl) (dsmtl))..	141.00	81.00	80.00	-----	529.00	1.30	13.20
108	Photo set, PH-261.....	21.00	14.50	22.00	2.114	6.00	0.0615	0.15
109	Power unit, PE-75.....	41.25	23.00	25.25	6.59	15.50	0.27	0.3875
110	Power unit, PE-95.....	-----	-----	-----	-----	44.00	0.85	1.10
111	Power unit, PE-210.....	15.00	19.00	19.00	1.80	5.75	0.625	0.14375
112	Power unit, PE-214.....	-----	-----	-----	-----	8.00	0.081	0.20
113	Power sup, PP-351/U.....	51.00	18.75	18.50	6.64	0.90	0.185	0.225
114	Processing eqp, PH-406.....	-----	-----	-----	-----	10.18	0.0915	0.2545
115	Processing unit, photo eqp, PH-668/U...	15.00	15.00	9.50	1.56	1.25	0.0125	0.0315
116	Projector, PH-222.....	15.00	7.88	1.00	0.90	1.83	0.0155	0.04575
117	Public address set, AN/TIQ-2.....	-----	-----	-----	-----	55.00	0.2925	1.725
118	Public address set, AN/TIQ-3.....	-----	-----	-----	-----	67.10	0.736	1.6775
119	Radar set, AN/MPQ-10 (mtd on tlr, V-62/MPQ-10).....	231.00	82.00	141.00	-----	1,563.90	2.90	39.00
120	(Radar con set, C-869/MPQ-10)....	36.00	36.00	36.00	-----	27.00	0.10	0.67
121	(Genr set, PU-26/U, tlr-mtd).....	165.00	83.00	99.00	-----	787.90	1.20	19.60
122	Radar survl central, AN/GSS-1.....	269.00	96.00	115.00	-----	1,760.00	7.80	44.00
123	Radiac set, AN/PDR-27.....	14.75	21.25	28.50	2.20	5.20	0.33	0.13
124	Radiac set, AN/PDR-39.....	13.00	9.00	11.00	0.875	0.74	0.005	0.0185
125	Radio repeater set, AN/MRC-54 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	2,732.00	11.25	68.30
126	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00	-----	1,942.13	9.20	48.50
127	(Shelter, S-141 (eqp instl) (dsmtl))..	141.00	81.00	80.00	-----	528.12	2.61	13.20
128	(Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00	-----	781.60	2.05	19.50
129	Radio set, AN/ARC-44.....	-----	-----	-----	-----	5.33	0.0449	0.1334
130	Radio set, AN/GRC-9.....	-----	-----	-----	-----	18.90	0.1295	0.4725
131	Radio set, AN/GRC-19.....	19.00	33.06	20.33	4.35	21.90	0.2355	0.5475
132	Radio set, AN/GRC-26.....	88.00	91.25	154.00	55.76	715.50	4.076	17.8875
133	Radio set, AN/GRC-26 (mtd on trk, 2½-ton, 6x6, WWN).....	-----	-----	-----	-----	2,688.00	11.19	67.20
134	(Shelter, S-56 A/G (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	127.00	-----	1,897.16	9.16	47.40
135	(Shelter, S-56 A/G (eqp instl) (dsmtl)).....	139.00	75.00	77.00	-----	464.90	2.74	11.60
136	(Genr set, PU-248/U, tlr-mtd).....	166.00	83.00	98.00	-----	781.60	2.01	19.50

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1	1	2	3	4	5	6	7	8
	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
		(Dimensions—in.)						
137	Radio set, AN/GRC-41 (mtd on trk, 2½-ton, 6x6, WWN)-----					2,688.00	11.00	67.20
138	(Shelter, S-56 A/G (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN))-----	139.00	75.00	77.00		1,897.10	9.00	47.40
139	(Genr set, PU-248 (mtd on tlr, 1½-ton, 2-wheel))-----	166.00	83.00	98.00		781.60	2.01	19.50
140	Radio set, AN/GRC-46 (mtd on trk, ¾-ton, 4x4, WWN)-----	189.00	74.00	90.00		723.00	3.50	18.30
141	(Shelter, S-144 (eqp instl) (dsmtl))-----	74.00	57.00	61.00		148.10	0.50	3.70
142	Radio set, AN/GRR-5-----	31.00	19.00	50.00	4.09	17.00	0.081	0.425
143	Radio set, AN/PRC-6-----	15.50	10.25	5.25	1.08	1.09	0.00544	0.02725
144	Radio set, AN/PRC-10-----	5.33	8.00	15.75	0.30	1.37	0.009	0.03425
145	Radio set, AN/VRC-9-----					16.10	0.075	0.4025
146	Radio set, AN/VRC-10-----					8.30	0.1175	0.2075
147	Radio set, AN/VRC-16-----					15.50	0.1555	0.3775
148	Radio terminal set, AN/MRC-68 (mtd on trk, ¾-ton, 4x4, WWN)-----					1,243.00	4.87	31.00
149	(Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN))-----	189.00	74.00	90.00		728.70	3.68	18.20
150	(Shelter, S-144 (eqp instl) (dsmtl))-----	74.00	57.00	61.00		149.00	1.89	3.70
151	(Genr set, PU-322/G, tlr-mtd)-----	147.00	74.00	83.00		522.80	0.96	13.00
152	Radio terminal set, AN/MRC-69 (mtd on trk, 2½-ton, 6x6, WWN)-----					2,732.00	11.20	68.30
153	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN))-----	269.00	96.00	130.00		1,942.00	9.14	48.50
154	(Shelter, S-141 (eqp instl) (dsmtl))-----	141.00	81.00	80.00		528.12	2.70	13.20
155	(Genr set, PU-294/G, tlr-mtd)-----	166.00	83.00	98.00		781.60	2.05	19.50
156	Radio terminal set, AN/MRC-73 (mtd on trk, 2½-ton, 6x6, WWN)-----					2,732.00	11.53	68.30
157	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN))-----	269.00	96.00	130.00		1,942.00	9.47	48.50
158	(Shelter, S-141 (eqp instl) (dsmtl))-----	141.00	81.00	80.00		529.00	3.03	13.20
159	(Genr set, PU-294/G, tlr-mtd)-----	166.00	83.00	98.00		781.60	2.05	19.70
160	Radio teletypewriter set, AN/GRC-46-----	80.00	62.00	66.50	34.40	190.00	0.75	4.75
161	Radiosonde baseline check set, AN/GMM-1-----	34.25	22.25	46.00	5.125	20.00	0.09	0.50
162	Radiosonde recorder, AN/TMQ-5-----	22.38	26.50	36.50	4.15	13.00	0.1855	0.325
163	Receiver, radio, R-390/URR-----	21.00	32.00	32.00	4.67	12.40	0.04958	0.31
164	Rectifier, RA-87-----	18.00	12.75	10.75	1.50	3.30	0.045	0.0825
165	Rectifier, RA-91-----					5.00	0.0975	0.125
166	Remote control, AN/GSA-7-----	30.00	30.00	22.00	6.25	11.00	0.1175	0.275
167	Repeater, telephone, AN/TCC-11-----	15.00	15.00	33.75	1.56	4.40	0.0685	0.11
168	Reperforator, transmitter, teletypewriter, TT 76/GGC-----	38.13	31.88	26.94	8.44	18.36	0.104	0.459
169	Stlr, van, V-51/G-----	312.00	96.00	132.00		2,288.00	7.70	57.20
170	Shelter, elec eqp, S-56/G-----	138.50	75.00	77.00		462.80	1.24	11.50
171	Shelter, elec eqp, S-89/G-----	74.00	57.00	61.00		148.50	0.30	3.70
172	Shelter, elec eqp, S-141/G-----	141.00	81.00	80.00		528.10	0.60	13.20
173	Shelter, elec eqp, S-144/G-----	74.00	57.00	61.00		148.50	0.30	3.70
174	Shop, rep, SigC, 2½-ton, 6x6, trk-mtd-----	269.00	96.00	131.00	179.00	1,957.00	8.00	48.90
175	Sig genr set, AN/URM-25-----	12.50	21.00	13.00	1.08	19.00	0.022	0.475

1	1	2	3	4	5	6	7	8
	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
	(Dimensions—in.)							
176	Sound recorder-reproducer, RD-87/U....	14.00	28.00	20.00	3.29	4.50	0.0535	0.1125
177	Spool, DR-8.....	9.00	8.00	8.00	0.50	0.70	0.00115	0.0175
178	Switchboard telephone manual, SB-22/PT.....	27.25	19.75	16.63	3.75	5.21	0.029	0.13025
179	Switchboard telephone manual, SB-86/P.....	35.25	29.63	38.50	7.29	19.50	0.15	0.4875
180	Telegraph-telephone terminal, AN/MCC-6 (mtd on trk, 2½-ton, 6x6, WWN).....					2,732.00	10.67	68.30
181	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00		1,942.00	8.61	48.50
182	(Shelter, S-141 (eqp instl) (dsmtl)).....	141.00	81.00	80.00		529.00	2.12	13.20
183	(Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00		781.60	2.05	19.70
184	Telephone repeater, AN-MCC-3 (mtd on trk, ¾-ton, 4x4, WWN).....					1,243.00	4.59	31.00
185	(Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN)).....	190.00	73.00	90.00		723.00	3.61	18.30
186	(Shelter, S-144 (eqp instl) (dsmtl)).....	74.00	57.00	61.00		149.00	0.64	3.70
187	(Genr set, PU-322/G, tlr-mtd).....	147.00	74.00	83.00		520.00	0.97	13.00
188	Telephone set, TA-263/PT.....	8.63	8.25	14.25	0.60	0.58	0.00675	0.0145
189	Telephone set, TA-264/PT.....					3.21	0.027	0.08025
190	Telephone set, TA-312/PT.....					0.58	0.00675	0.0145
191	Telephone terminal, AN/MCC-9 (mtd on trk, ¾-ton, 4x4, WWN).....					1,243.00	4.57	31.00
192	(Shelter, S-144 (eqp instl) (mtd on trk, ¾-ton, 4x4, WWN)).....	190.00	73.00	90.00		723.00	3.59	18.30
193	(Shelter, S-144 (eqp instl) (dsmtl)).....	74.00	57.00	61.00		149.00	0.62	3.70
194	(Genr set, PU-322/G, tlr-mtd).....	147.00	74.00	83.00		520.00	0.97	13.00
195	Teletypewriter op een, AN/MGC-19 (mtd on trk, 2½-ton, 6x6, WWN).....					2,732.00	9.85	68.30
196	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00		1,942.00	7.79	48.50
197	(Shelter, S-141 (eqp instl) (dsmtl)).....	269.00	96.00	80.00		529.00	1.35	13.20
198	(Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00		781.60	2.05	19.70
199	Teletypewriter set, AN/PGC-1.....	30.88	25.88	22.38	5.40	10.34	0.075	0.2583
200	Teletypewriter, TT-4/TG.....	28.88	23.88	21.13	5.40	12.50	0.0475	0.3125
201	Terminal, telegraph, AN/MSC-29 (mtd on trk, 2½-ton, 6x6, WWN).....					2,732.00	9.66	68.30
202	(Shelter, S-141 (eqp instl) (mtd on trk, 2½-ton, 6x6, WWN)).....	269.00	96.00	130.00		1,942.10	7.62	48.50
203	(Shelter, S-141 (eqp instl) (dsmtl)).....	141.00	81.00	80.00		528.10	1.17	13.20
204	(Genr set, PU-294/G, tlr-mtd).....	166.00	83.00	98.00		781.60	2.05	19.50
205	Terminal, telegraph-telephone, AN/TCC-14.....	25.50	16.50	12.50	1.50	3.05	0.04425	0.07625
206	Terminal, telephone, AN/TCC-7.....					62.49	0.269	1.5625
207	Test eqp, IE-9.....					40.00	0.475	1.00
208	Test set, I-142.....	18.69	16.50	9.50	2.11	1.25	0.01845	0.03125
209	Test set, I-181.....	10.75	19.00	12.00	1.40	1.00	0.0125	0.025
210	Test set, TS-2/TG.....	28.00	20.50	17.50	4.00	5.80	0.085	0.145
211	Test set, TS-26/TSM.....	9.50	9.50	13.50	0.62	0.45	0.0056	0.0115
212	Test set, TS-27/TSM.....	20.00	15.75	22.50	2.50	3.00	0.025	0.075
213	Test set, TS-190/U.....	5.50	6.50	4.69	0.25	0.08	0.00106	0.002

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1	1	2	3	4	5	6	7	8
	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
		(Dimensions—in.)						
214	Test set, electron tube, TU-7/U.....	6.17	8.00	0.38	0.37	2.20	0.0115	0.055
215	Tool eqp, TE-33.....	8.38	3.00	1.75	0.19	0.07	0.00275	0.00175
216	Tool eqp, TE-41.....					1.70	0.0195	0.0425
217	Tool eqp, TK-21/G.....					3.00	0.0365	0.075
218	Tool eqp, TK-28/GF.....					1.20	0.0175	0.03
219	Tripod, PH-524/PF.....	21.00	10.00	10.00	1.46	0.35	0.0034	0.00875
220	Wind measuring set, AN/MMQ-1.....	144.00	72.00	96.00	72.00	576.00	1.45	14.40
221	Wind measuring set, AN/MMQ-1 (mtd on tlr, cgo, ¾-ton, 2-wheel).....	147.00	74.00	83.00	-----	522.80	1.30	13.00
222	Wire, reel, RL-159/U.....					3.80	0.0125	0.095
223	Wire, WD-1/TT, on reel, DR-5.....	19.25	18.00	19.25	2.37	4.00	0.044	0.10
224	Wire, WD-1/TT, on reel, RL-159U.....				-----	4.00	0.029	0.10

5.11. Items of Transportation Equipment^{1 2}

	1	2	3	4	5	5	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
	<i>Air:</i>								
2	Airplane ³ ---	L-19, fxd-wing, lt obsn---	300.00	47.00	90.00	100	750	1.00	418.00
3	-----	L-20, fxd-wing, util.....	363.60	52.00	124.80	131	1,651	1.60	432.00
4	-----	L-23, fxd-wing, util trans-							
5	-----	port.....	378.00	195.00	135.60	513	5,857	2.00	4145.00
	-----	U-1A, fxd-wing, transport	501.60	140.00	151.20	489	6,162	-----	4151.00
6	Helicopter ³ ---	H-13, rotary-wing, obsn---	382.00	114.00	113.00	303	2,922	1.00	473.00
7	-----	H-19, rotary-wing, util---	548.00	139.00	110.00	545	3,590	2.70	4175.00
8	-----	H-21, rotary-wing, lt							
	-----	transport.....	631.00	168.00	189.00	761	12,170	3.70	4290.00
9	-----	H-23, rotary-wing, obsn---	338.00	92.00	128.00	216	2,300	1.00	451.00
10	-----	H-34, rotary-wing, lt							
	-----	transport.....	530.00	144.00	170.00	480	6,880	3.60	4188.00
11	-----	H-37, rotary-wing, med							
	-----	transport.....	668.00	328.00	180.00	1,520	22,910	9.90	4577.00
12	-----	HU-1A, rotary-wing, util---	474.00	97.20	175.20	-----	-----	-----	-----
	<i>Marine:</i>								
13	BARC-----	Lighter, amph, 60-ton, design BARC-----	751.00	319.00	249.00	1,658	34,404	97.50	860.10
14	Barge-----	Deck cgo, nonpropelled, steel, 81-ft, design 7001, sectionalized, nesting---	972.00	264.00	84.00	1,782	12,474	64.40	311.90
15	-----	Deck cgo, nonpropelled, steel, 570-ton, 110-ft, design 7005. ⁵ -----	1,320.00	384.00	-----	3,520	-----	134.40	-----

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9
	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
	(Dimensions—in)								
	Marine— Continued:								
16	Barge—Continued	Deck cgo, nonpropelled, steel, 585-ton, 120-ft, design 231-A. ⁵	1,440.00	396.00	126.00	3,960	41,580	196.00	1,039.50
17	-----	Deck or liq cgo, nonpropelled, steel, design 218-E (knocked down)	545.00	216.00	54.00	818	3,681	14.50	92.00
18	-----	Deck or liq cgo, nonpropelled, steel, 578-ton or 4,160-bbl, 120-ft, design 231-B (knocked down). ⁵	1,440.00	396.00	-----	3,960	-----	196.00	-----
19	-----	Inland waterways, SP, diesel, steel, 55-ft, design 3011	674.00	180.00	91.00	843	5,691	47.10	142.10
20	-----	Liq cgo, nonpropelled, steel, 235-ft, design 7004. ⁵	2,820.00	480.00	⁶ 141.00	9,400	110,450	392.00	2,761.30
21	-----	Liq cgo, SP, diesel, steel, 182-ft, design 294-A. ⁷	2,190.00	360.00	204.00	5,475	93,075	533.00	2,326.90
22	-----	Pier, nonpropelled, steel, 150-ft, design 380 (knocked down)	1,800.00	600.00	-----	2,250	-----	278.90	-----
23	-----	Refrigerated cgo, nonpropelled, steel, 14,200-cu ft, 120-ft, design 7010. ⁵	1,440.00	396.00	⁶ 120.00	3,960	39,600	257.60	990.00
24	-----	Rep shop, ftg, marine eqp, nonpropelled, steel, 510-ft, design 7011. ⁵	2,525.00	480.00	-----	8,424	-----	1,300.00	-----
25	Boat-----	Aaft rescue, gas, wood, 85-ft, design 379	1,020.00	243.00	134.00	1,722	18,942	35.30	473.60
26	-----	Passenger and cgo, diesel, steel, 65-ft, design 2001	786.00	212.00	252.00	1,158	24,318	74.00	608.00
27	-----	Picket, diesel, steel, 46-ft, design 4003	556.00	147.00	156.00	568	7,384	11.00	184.60
28	-----	Picket, diesel, wood, 36-ft 6-in, design 243-B	438.00	127.00	112.00	386	3,602	6.80	90.10
29	-----	Picket, diesel, wood, 63-ft, design 4002	779.00	191.00	192.00	1,032	16,512	34.70	412.80
30	-----	Util, diesel, plastic, 26-ft, design 6009	318.00	97.00	⁶ 69.00	214	1,231	3.40	30.80
31	Crane-----	Barge, diesel-elec, revolving, steel, 60 long tons, design 413-D. ⁵	1,704.00	696.00	-----	8,236	-----	1,120.00	-----
32	-----	Barge, diesel-elec, revolving, steel, 89 long tons, design 264-B. ⁶	1,680.00	840.00	-----	9,800	-----	15,688.00	-----
33	Landing craft.	Mechanized, diesel, steel, Mark VI, Navy design LCM(6)	672.00	168.00	160.00	784	10,192	31.40	254.80

See footnotes at end of table.

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1	1	2	3	4	5	5	7	8	9
	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
	(Dimensions—in)								
34	Marine—Cont.: Landind Craft— Continued.	Mechanized, diesel, steel, Mark VIII, Navy de- sign LCM(8)-----	884.00	252.00	164.00	1,550	21,090	67.20	527.30
35	-----	Util, diesel, steel, Navy design LCU, 1466 class, sectionalized-----	1,380.00	408.00	261.00	3,910	85,043	201.60	2,126.10
36	-----	Vehicle, pers, diesel, wood, 36-ft, Navy design LCVP-----	432.00	125.00	130.00	382	4,126	9.00	103.20
37	Ponton-----	Sectional, curved end, steel, 7' x 7' x 5' 1/2", Mark T-7A, W connec- tors-----	84.00	84.00	61.00	49	245	1.40	6.12
38	-----	Sectional, end ramp, steel, 5' 1/2" x 7' x 3' 6", Mark T-11, W connec- tors-----	.61.00	84.00	42.00	35	123	0.90	3.10
39	-----	Sectional, intmed ramp, steel, 5' 1/2" x 7' x 4' 11 3/8", Mark T-8, W connectors-----	61.00	84.00	60.00	35	175	1.10	4.40
40	-----	Sectional, rectangular, steel, 7' x 5' 1/2" x 5' 1/2", Mark T-6B, W connectors-----	84.00	61.00	61.00	35	175	1.00	4.40
41	Propelling unit.	Marine, outboard, diesel, 165 HP, design 9002---	307.00	60.00	77.00	127	828	7.50	20.70
42	Tug-----	Harbor, diesel, 200 HP, steel, 45-ft, design 320--	543.00	150.00	180.00	565	8,475	28.20	211.90
43	-----	Harbor diesel, 600 HP, steel, 65-ft, design 3004--	840.00	234.00	273.00	1,365	30,054	112.00	751.40
44	-----	Harbor, diesel, 1,200 HP, steel, 100-ft, design 3006.7-----	1,284.00	318.00	-----	2,840	-----	320.50	-----
45	-----	Oceangoing, diesel-elec, 1,530 HP, steel, 143-ft, design 377-A.7-----	1,721.00	396.00	-----	4,736	-----	623.00	-----
46	Vessel-----	Sup, diesel, steel, 176-ft, design 381.7-----	2,118.00	384.00	-----	5,648	-----	510.80	-----
47	Rail: Locomotive, diesel-elec (36-39 3/4- 42-in.).	48-ton, 0-4-4-0 road switcher-----	420.00	102.00	136.00	298	3,380	58.00	84.30
48	Locomotive, diesel-elec (56 1/2-60- 63-66-in.).	60-ton, 0-4-4-0 road switcher-----	420.00	102.00	136.00	298	3,380	58.00	84.30

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9
	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measurement tons
	(Dimensions—in)								
	<i>Rail—Continued:</i>								
49	Locomotive, diesel-elec (36-39 $\frac{3}{8}$ -42-in.).	80-ton, 0-6-6-0 road switcher.....	504.00	108.00	131.00	378	4,130	72.00	103.20
50	Locomotive, diesel-elec (56 $\frac{1}{2}$ -60-63-66-in.)	120-ton, 0-6-6-0 road switcher.....	642.00	116.00	163.00	518	3,380	116.20	175.60
51	Locomotive, steam (36-39 $\frac{3}{8}$ -42-in.).	60-ton, 2-8-2 road.....	428.50	102.38	136.00	304	3,465	52.00	89.30
		Tender.....	285.00	102.38	136.00	202	2,285	20.80	57.50
52	Locomotive, steam (56 $\frac{1}{2}$ -60-63-66-in.).	82-ton, 2-8-0 road.....	393.50	116.00	163.00	321	4,330	74.00	107.00
		Tender.....	286.00	116.00	163.00	234	3,158	23.20	77.80
53	Railway car (36-39 $\frac{3}{8}$ -42-in.).	Amb, ki-diner-stor.....	734.25	100.00	133.56	509	5,650	45.00	140.40
54	-----	Amb, pers.....	734.25	100.00	133.56	509	5,650	45.50	140.40
55	-----	Amb, ward.....	734.25	100.00	133.56	509	5,650	46.00	140.40
56	-----	Box, 30-ton.....	458.25	95.38	128.75	302	3,230	13.60	450.60
57	-----	Flat, 30-ton.....	458.25	95.38	44.00	302	1,110	11.00	420.60
58	-----	Gondola, high side, 30-ton	458.25	95.38	92.00	302	2,315	13.30	427.50
59	-----	Gondola, low side, 30-ton	458.25	95.38	62.00	302	1,560	12.10	424.00
60	-----	Tk, 6,000-gal.....	419.75	95.38	145.00	278	3,350	17.50	84.00
61	Railway car (56 $\frac{1}{2}$ -60-63-66-in.).	Amb, ki-diner-stor.....	794.00	114.00	157.00	628	8,220	54.70	179.30
62	Railway car (56 $\frac{1}{2}$ -60-63-66-in.).	Amb, pers.....	794.00	114.00	157.00	628	8,220	54.20	179.30
63	-----	Amb, ward.....	794.00	114.00	157.00	628	8,220	55.20	179.30
64	-----	Box, 40-ton.....	530.75	114.00	139.44	420	4,885	18.00	459.00
65	-----	Flat, 40-ton.....	530.75	114.00	56.06	420	1,631	14.40	424.00
66	-----	Flat, depressed cen, 70-ton ⁸	492.00	116.00	40.00	396	1,334	38.00	433.10
67	-----	Flat, 80-ton.....	603.50	116.00	52.13	486	2,104	35.50	427.60
68	-----	Gondola, high side, 40-ton	530.75	114.00	104.06	420	3,640	17.70	432.10
69	-----	Gondola, low side, 40-ton	530.75	114.00	74.06	420	2,582	15.20	428.00
70	-----	Refrg, 40-ton.....	530.75	114.00	139.44	420	4,885	19.00	459.00
71	-----	Tk, 10,000-gal.....	505.50	114.00	157.81	399	5,240	20.00	140.50

See footnotes at end of table

	1	2	3	4	5	5	7	8	9
1	Class	Type or model	Length	Width	Height	Sq ft	Cu ft	Short tons	Measure- ment tons
			(Dimensions—in)						
72	Miscellaneous: Cgo transporter.	Box, metal, shipping, steel, 295-cu ft cap, max load 9,000-lb.....	102.00	75.00	82.50	53	366	0.75	9.10
73	Liq transporter.	Transporter, liq, rolling- wheel type, 1,000-gal, T-3.....	140.50	98.00	64.00	96	509	1.20	12.80

¹Items exceeding 1 short ton, uncrated.

²Weights of vehicles shown in column 8 are weights of vehicles not loaded.

³Slight variation in specifications of different models; e.g., L-20A, L-20B, etc.

⁴Knocked down.

⁵May be towed to destination.

⁶Indicated height does not include equipment above deck

⁷Self-deliverable

⁸Car is not designed to operate on 63-inch gage.

5.12. Items of Construction and Fortification Materials*

a. Engineer.

	1	2	3
1	Type or model	Short tons	Measure- ment tons
2	Asphalt/mile (24-ft wide, 3-in. thick)	90.0	76.00
3	Cement.....	1.0	0.53
4	Explosive (40% and 60% dynamite) ¹	1.0	1.00
5	Track, 90 lb/yard, rail/mile of track.....	158.5	48.00
6	Track, rail turnout, complete, 90 lb/yard, each.....	9.6	6.70
7	Sandbags, per 100,000.....	16.5	100.00
8	Loose, pit-run gravel.....	1.4	1.00
9	Crushed rock, loose.....	1.34	1.00
10	Pipe, 4-in., with fittings (1 mi).....	24.2	-----
11	Pipe, 6-in., lt, with fittings and pump (1 mi).....	33.0	-----
12	Pipe, 6-in., hv, with fittings and pump (1 mi).....	49.5	-----
13	Tank, 10,000-barrel, steel.....	46.0	-----

¹Ordnance item.

*Items exceeding 1 short ton, uncrated.

b. Signal.

	1	2	3
	Type or model	Short tons	Measurement tons
2	Wire, WD-1()/TT, on spool, DR-8().....	1,320 ft, 13 lb..	-----
3	Wire, WD-1()/TT, on wire reel, RL-159()/U.....	5,280 ft, 66 lb..	-----
4	Wire, WD-1()/TT, on reel, DR-5.....	2½ mi, 145 lb..	-----
5	Wire, WD-1()/TT, on wire dispenser, MX-306()/G (wire, WD-1()/TT alone weighs 46 lb per mile).....	2,640 ft, 26 lb..	-----
6	100-mi requirements (spiral-4 cable) without poles.....	26.5	39.0
7	Same with poles.....	187.5	282.0
8	300 miles, open wire, crossarms, hardware, etc., without poles.....	527.0	502.0
9	Same with poles.....	3,067.0	3,842.0
10	100-mi tactical radio (radio relay with carrier equipment).....	42.0	104.0

Section IV. CLASS III SUPPLY

5.13. Liquid Fuel and Lubricant Data

a. Vehicles.

	1	2	3	4	5	6
	Vehicle	Vehicle fuel tank capacity (gal)	Fuel per 100 miles (gal)	Oil per 100 miles (gal)	Gear lubricant per 100 miles (lb)	Miscellaneous greases per 100 miles (lb)
2	Automobile, sedan, hv.....	20.0	7.0	0.2	0.1	0.1
3	Automobile, sedan, lt.....	16.0	5.8	0.2	0.1	0.1
4	Automobile, sedan, med.....	17.0	6.0	0.2	0.1	0.1
5	Carrier, cgo, amph, full-tracked, M29.....	35.0	20.0	1.5	0.8	0.5
6	Carrier, cgo, amph, full-tracked, M29C ²	35.0	23.0	1.5	1.0	0.5
7	Carrier, cgo, amph, full-tracked, M76.....	60.0	30.0	2.2	0.8	1.5
8	Carrier, lt wpn, inf, ½-ton, 4x4, M274.....	8.0	6.7	0.2	0.2	0.2
9	Carrier, pers, full-tracked, armd, M59.....	130.0	100.0	2.0	-----	2.0
10	Carrier, pers, full-tracked, armd, M113.....	80.0	40.0	-----	-----	-----
11	Gun, twin 40-mm, SP, full-tracked, M42A1.....	140.0	117.0	4.0	1.5	2.0
12	Gun, 90-mm, SP, full-tracked, M56 (abn).....	55.0	20.0	2.2	0.8	1.5
13	Howitzer, 105-mm, SP, full-tracked, M52A1.....	176.0	166.0	4.1	1.5	2.5
14	Howitzer, 155-mm, SP, full-tracked, M44A1.....	150.0	166.0	3.9	1.5	2.5
15	Howitzer, 8-in., SP, full-tracked, M55.....	350.0	234.0	4.0	1.7	2.8
16	Landing vehicle, wheeled, 2½-ton, 6x6.....	40.0	16.7	0.6	0.9	0.3
17	Mortar, 4.2-in., SP, full-tracked, M84.....	130.0	130.0	2.0	-----	2.0
18	Motorcycle, solo.....	3.5	2.4	0.2	0.1	0.1
19	Motorscooter.....	2.0	2.0	0.2	0.1	0.1
20	Shop eqp, contact maint, trk-mtd.....	50.0	20.0	0.4	0.8	0.4
21	Shop eqp, mtz, GP.....	45.0	20.0	0.4	0.8	0.4
22	Shop, rep, SigC, 2½-ton, 6x6, trk-mtd.....	50.0	20.0	0.4	0.8	0.4
23	Tk, cmbt, full-tracked, lt gun, M41A3.....	140.0	83.3	3.7	1.5	1.5
24	Tk, cmbt, full-tracked, med gun, M48A2.....	330.0	246.0	5.1	2.0	1.0
25	Tk, cmbt, full-tracked, med gun, M60.....	375.0	140.0	0.7	-----	-----
26	Tk, cmbt, full-tracked, 120-mm gun, M103A1.....	280.0	350.0	5.2	1.5	2.5
27	Tk recovery vehicle, hv, M51.....	385.0	296.0	4.1	2.0	2.5

See footnotes at end of table.

	1	2	13	14	5	6
1	Vehicle	Vehicle fuel tank capacity (gal)	Fuel per 100 miles (gal)	Oil per 100 miles (gal)	Gear lubricant per 100 miles (lb)	Miscellaneous greases per 100 miles (lb)
28	Tractor, full-tracked, high-speed, M8A2.....	225.0	104.0	3.8	1.5	3.0
29	Tractor, full-tracked, high-speed, 13-ton, M5.....	80.0	53.0	2.0	1.5	2.0
30	Tractor, full-tracked, high-speed, 18-ton, M4.....	125.0	125.0	2.1	1.5	2.0
31	Tractor, full-tracked, high-speed, 38-ton, M6.....	300.0	330.0	2.8	1.5	2.0
32	Trk, amb, frontline, 1/4-ton, 4x4.....	20.0	7.1	0.3	0.1	0.2
33	Trk, util, 1/4-ton, 4x4.....	17.0	7.1	0.2	0.2	0.2
34	Trk, 3/4-ton, 6x6, XM408.....	17.0	6.9	0.1	0.1	0.3
35	Trk, cgo, 3/4-ton, 4x4.....	24.0	12.0	0.2	0.3	0.3
36	Trk, wkr, 3/4-ton, 6x6, XM408.....	17.0	6.9	0.1	0.1	0.3
37	Trk, cgo, 2 1/2-ton, 6x6, M34.....	50.0	20.0	0.4	0.8	0.4
38	Trk, cgo, 2 1/2-ton, 6x6, M35.....	50.0	20.0	0.4	0.8	0.4
39	Trk, cgo, 2 1/2-ton, 6x6, XLWB, M41.....	50.0	20.0	0.4	0.8	0.4
40	Trk, cgo, 2 1/2-ton, 6x6, M135.....	56.0	22.2			
41	Trk, cgo, 2 1/2-ton, 6x6, M211.....	56.0	17.2			
42	Trk, crane, 2 1/2-ton, 6x6, M108.....	50.0	14.3	0.7	0.7	0.5
43	Trk, dump, 2 1/2-ton, 6x6, LWB, M47.....	50.0	20.0	0.4	0.8	0.4
44	Trk, lt wkr, 2 1/2-ton, 6x6, M60.....	50.0	20.0	0.4	0.8	0.4
45	Trk, shop van, 2 1/2-ton, 6x6, WWN.....	56.0	20.0	0.4	0.8	0.4
46	Trk, tk, gas, 2 1/2-ton, 6x6, M217.....	56.0	20.0	0.4	0.8	0.4
47	Trk, tractor, 2 1/2-ton, 6x6, M221.....	56.0	22.2	0.4	0.8	0.4
48	Trk, tractor, 2 1/2-ton, 6x6, M275.....	50.0	18.0	0.4	0.8	0.4
49	Trk, cgo, 5-ton, 6x6, M41.....	78.0	32.3	0.6	0.9	0.8
50	Trk, cgo, 5-ton, 6x6, M54.....	78.0	32.3	0.8	0.4	0.5
51	Trk, med wkr, 5-ton, 6x6, M62.....	78.0	37.0	0.8	0.4	0.5
52	Trk, tractor, 5-ton, 6x6, M52.....	110.0	34.0	0.6	0.9	0.8
53	Trk, tractor, wkr, 5-ton, 6x6, M246.....	78.0	22.5	0.4	0.8	0.4
54	Trk, cgo-prime mover, 10-ton, 6x6, M125.....	150.0	50.0	0.8	0.8	1.0
55	Trk, tractor, 10-ton, 6x6, M123.....	150.0	³ 50.0	0.8	0.8	1.0
56	Trk, tractor, 12-ton, 6x6, M26A1 (tk transporter).....	120.0	100.0	1.5	0.9	1.1
57	Trk, gun-lifting, hv, 4x4, front, M249.....	140.0	100.0			
58	Trk, gun-lifting, hv, 4x4, rear, M250.....	140.0	100.0			

¹ For arctic winter operations, increase amounts by 25 percent.

² In water, the Weasel, M29C, uses 2 1/2 gal of fuel per hour.

³ Unless used with M15A1, modified stlr for transporting M48 tank.

b. Construction Equipment.

	1	2	13
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu/hr.....	Gasoline	0.50
3	Boat, brg erection, gas-eng driven, aluminum, 19-ft long.....	Gasoline	9.00
4	Boat, brg erection, gas-eng driven, aluminum, 27-ft long.....	Gasoline	18.00
5	Boiler, steam, high-pressure, 12 HP.....	Oil	4.00
6	Compressor, air, reciprocating, tlr-mtd, diesel-eng driven, 210 CFM.....	Diesel	8.00
7	Compressor, air, reciprocating, trk-mtd, gas-eng driven, 210 CFM.....	Gasoline	5.00

See footnote at end of table.

1	Type	2 Type of fuel	13 Estimated average rate of consumption in gal per hour
8	Compressor, air, reciprocating, trk-mtd, W gas power unit, 80 CFM, air-cooled.....	Gasoline	8.50
9	Compressor, air, reciprocating, wheel-mtd, gas-eng driven, 600 CFM.....	Gasoline	1.30
10	Crane-shovel, power unit, abn, 7½-ton, ½ cu yd.....	Gasoline	-----
11	Crane-shovel, trk-mtd, gas-eng driven, 2-ton cap.....	Gasoline	1.70
12	Crane-shovel, trk-mtd, gas-eng driven, 10-ton cap, ½ cu yd.....	Gasoline	3.00
13	Crane-shovel, trk-mtd, gas-eng driven, 20-ton cap, ¾ cu yd.....	Gasoline	3.50
14	Crane, nonrevolving, tractor-op, diesel-eng driven, 40,000-lb cap.....	Diesel	7.00
15	Grader, road, mtz, diesel-eng driven, 12-ft blade.....	Diesel	8.00
16	Grader, road, mtz, diesel-eng driven, 8,975-lb pressure at blade, 10-ft blade.....	Diesel	5.00
17	Grader, road, mtz, diesel-eng driven, 8,000-12,000-lb DBP.....	Diesel	8.00
18	Grader, road, mtz, diesel-eng driven, tandem, 12,500-14,475-lb DBP, 12-ft.....	Diesel	-----
19	Grader, road, mtz, diesel-eng driven, 12,000-17,000-lb DBP.....	Diesel	8.00
20	Loader, scoop-type, diesel-eng driven, 4-wheel, 1½ cu yd.....	Diesel	3.00
21	Roller, road, gas-eng driven, 2-axle tandem, 5-to 8-ton.....	Gasoline	3.50
22	Roller, road, gas-eng driven, 3-wheel, 10-ton.....	Gasoline	3.50
23	Tractor, full-tracked, low-speed, diesel-eng driven, W armd cab.....	Diesel	5.00
24	Tractor, full-tracked, low-speed, diesel-eng driven, med DBP.....	Diesel	10.00
25	Tractor, full-tracked, low-speed, diesel-eng driven, 8,600-12,000-lb DBP.....	Diesel	9.00
26	Tractor, full-tracked, low-speed, diesel-eng driven, 12,100-17,000-lb DBP.....	Diesel	15.00
27	Tractor, full-tracked, low-speed, diesel-eng driven, 17,100-24,000-lb DBP, W angledozer...	Diesel	10.00
28	Tractor, full-tracked, low-speed, diesel-eng driven, 24,100-32,000-lb DBP, W bulldozer...	Diesel	11.00
29	Tractor, saw power unit, wheelbarrow-type, 2-wheel, pneumatic tires, gas-eng driven, 22 HP.	Gasoline	1.50
30	Tractor, wheeled, ind, gas-eng driven, 3,700-4,000-lb DBP.....	Gasoline	4.00
31	Tractor, wheeled, whs, gas, 4 pneumatic-tired wheels, 4,000-lb cap.....	Gasoline	0.75
32	Trk, lift, fork, gas, 2,000-lb, solid rubber tires.....	Gasoline	0.57
33	Trk, lift, fork, gas, 4,000-lb, pneumatic tires.....	Gasoline	0.58
34	Trk, lift, fork, gas, 4,000-lb, solid rubber tires.....	Gasoline	0.58
35	Trk, lift, fork, gas, 6,000-lb, pneumatic tires.....	Gasoline	0.91
36	Trk, lift, fork, gas, 6,000-lb, pneumatic tires, rough terrain.....	Gasoline	3.50
37	Trk, lift, fork, gas, 6,000-lb, solid rubber tires.....	Gasoline	0.91
38	Trk, lift, fork, gas, 10,000-lb, pneumatic tires, rough terrain.....	Gasoline	5.00
39	Trk, lift, fork, gas, 15,000-lb, pneumatic tires, rough terrain.....	Gasoline	8.20

¹ Normal daily operation of equipment will be 20 hours per day, with 4 hours set aside for maintenance

c. *Army Aircraft.* For fuel capacities, consumption rates, and grades, see paragraph 7.43b.

d. *Locomotives.*

(1) *Fuel oil (oil-burning steam locomotives).*

1	Type of locomotive	2 Type of operation	3 Estimated average rate of fuel oil consumption	
			4	
			Pounds/train-mile	Pounds/hour
2	2-8-0 standard gage.....	Road	55	450
3	2-8-2 narrow gage.....	Road	60	500

(2) Diesel oil (diesel-electric locomotives).

1	2	3		4
	Type of locomotive	Type of operation	Estimated average rate of diesel oil consumption	
			Gal/train-mile in road service	Gal/hour in switching service
	<i>Standard gage:</i>			
2	0-4-4-0, diesel-elec, 60-ton.....	Road switcher.....	0.9	4.0
3	0-6-6-0, diesel-elec, 120-ton.....	Road switcher.....	2.5	7.5
	<i>Narrow gage:</i>			
4	0-4-4-0, diesel-elec, 48-ton.....	Road switcher.....	0.9	4.0
5	0-6-6-0, diesel-elec, 80-ton.....	Road switcher.....	1.5	6.0

In estimating fuel requirements, it is recommended that 5 percent be added to computed rate of consumption to allow for contingencies.

(3) *Lubricants.* Estimated lubricating oil and grease requirements for motive power and rolling stock—1,000 pounds

e. Marine.

per month for each train per day (moving in either direction) for each division.

(4) *Switch engines.* For general planning purposes, assume operation of switch engines for 20 hours per day. Allow 4 hours per day for maintenance.

1	2	3
	Type of fuel	Estimated average rate of consumption in gal per hour
2	Barge, inland waterways, SP, diesel, steel, 55-ft, design 3011.....	Diesel 19.0
3	Barge, liq cgo, SP, diesel, steel, 6,500-bbl, 182-ft, design 294-A.....	Diesel 40.0
4	Boat, acft rescue, gas, wood, 85-ft, design 379.....	Gasoline { 153.0 (main) 14.0 (aux)
5	Boat, passenger and cgo, diesel, steel, 65-ft, design 2001.....	Diesel 15.0
6	Boat, picket, diesel, steel, 46-ft, design 4003.....	Diesel 19.0
7	Boat, picket, diesel, wood, 36-ft 6-in., design 234-B.....	Diesel 10.0
8	Boat, picket, diesel, wood, 63-ft, design 4002.....	Diesel 23.0
9	Boat, util, diesel, plastic, 26-ft, design 6009.....	Diesel 3.5
10	Crane, barge, diesel-elec, revolving, steel, 60 long tons, design 413-D.....	Diesel 16.0
11	Crane, barge, diesel-elec, revolving, steel, 89 long tons, design 264-B.....	Diesel 22.0
12	Landing craft, mechanized, diesel, steel, Mark VI, Navy design LCM(6).....	Diesel 24.0
13	Landing craft, mechanized, diesel, steel, Mark VIII, Navy design LCM(8).....	Diesel 34.0
14	Landing craft, util, diesel, steel, Navy design LCU, 1466 class, sectionalized.....	Diesel 28.0
15	Landing craft, vehicle, pers, diesel, wood, 36-ft, Navy design LCVP.....	Diesel 12.0
16	Lighter, amph (BARC), SP, diesel, steel, 60-ton, 61-ft, design 2303.....	Diesel 38.0
17	Propelling unit, marine, outboard, diesel, 165 HP, design 9002.....	Diesel 10.0
18	Trk, amph, 2½-ton, 6x6.....	Gasoline 8.0
19	Tug, harbor, diesel, 200 HP, steel, 45-ft, design 320.....	Diesel 10.0
20	Tug, harbor, diesel, 600 HP, steel, 65-ft, design 3004.....	Diesel 34.0
21	Tug, harbor, diesel, 1,200 HP, steel, 100-ft, design 3006.....	Diesel 68.0
22	Tug, oceangoing, diesel-elec, 1,530 HP, steel, design 377-A.....	Diesel 86.0

See footnote at end of table.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
23	Vessel, liq cgo, diesel, steel, 11,500-bbl, 210-ft, design 7014.....	Diesel	80.0
24	Vessel, sup, diesel, steel, 176-ft, design 381.....	Diesel	57.0

¹ The fuel consumption for diesel-powered floating equipment has been determined by the following formula:

$$\text{Hourly fuel (diesel) consumption} = \frac{\text{Rated HP} \times 0.41 \text{ (lb)}}{7.2 \text{ (lb per gal (diesel))}}$$

f. Power Units.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Charger, battery, PP-775/U, W 5-kw genr set, tlr-mtd.....	Gasoline	1.50
3	Genr set, ptbl, diesel-eng driven, skid-mtd, 60 cy 15 kw.....	Diesel	2.60
4	Genr set, ptbl, diesel-eng driven, skid-mtd, 60 cy, 30 kw.....	Diesel	4.50
5	Genr set, ptbl, diesel-eng driven, skid-mtd, 60 cy, 45 kw.....	Diesel	6.00
6	Genr set, ptbl, diesel-eng driven, skid-mtd, 60 cy, 60 kw.....	Diesel	6.00
7	Genr set, ptbl, gas-eng driven, skid-mtd, AC, 60 cy, 1½ kw.....	Gasoline	0.31
8	Genr set, ptbl, gas-eng driven, skid-mtd, DC, 60 cy, 1-5 kw.....	Gasoline	0.31
9	Genr set, ptbl, gas-eng driven, skid-mtd, 60 cy, 3 kw.....	Gasoline	0.63
10	Genr set, ptbl, gas-eng driven, skid-mtd, 60 cy, 6 kw.....	Gasoline	1.00
11	Genr set, ptbl, gas-eng driven, skid-mtd, AC, 60 cy, 10 kw.....	Gasoline	2.00
12	Genr set, ptbl, gas-eng driven, skid-mtd, AC, 60 cy, 15 kw.....	Gasoline	-----
13	Genr set, ptbl, gas-eng driven, skid-mtd, 60 cy, 30 kw.....	Gasoline	6.00
14	Power unit, PE-75.....	Gasoline	0.65
15	Power unit, PE-95.....	Gasoline	1.80
16	Power unit, PE-195.....	Gasoline	1.10
17	Power unit, PE-197.....	Gasoline	1.20
18	Power unit, PE-198.....	Diesel	3.00
19	Power unit, PE-214.....	Oil and gasoline.	0.15
20	Power unit, PU-290/MR.....	Gasoline	1.10
21	Power unit, PU-294/G.....	Gasoline	1.10
22	Power unit, PU-322/G.....	Gasoline	2.00

g. Miscellaneous.

	1	2	3
1	Type	Type of fuel	Estimated average rate of consumption in gal per hour
2	Conversion and stor unit, carbon-dioxide, stlr-mtd..... Genr and chg plant, liq-oxy and nitrogen, stlr-mtd:	Gasoline	2.10
3	Air Products model A-2 ¹	Diesel	12.00
4	Air Products model LON-5.....	Diesel	38.00
5	Air Products model LEON-20.....	Diesel	140.00
6	Heater, duct-type, ptbl, gas, 250,000 Btu.....	Gasoline	2.00 to 4.00
7	Ldry unit, tlr-mtd, gas-eng driven.....	Gasoline	10.80
8	Refrg unit, mech, gas-eng driven.....	Gasoline	0.90 to 1.25

¹ Power source for A-2 plant is a 100-kw generator.

5.14. Bulk Petroleum Distribution

	1	2
1	Type of carrier	Amount carried
	Barges:	
2	Deck or liq cgo, nonpropelled, steel.....	9,000 to 175,000 gal ¹
3	Liq cgo, nonpropelled, steel.....	546,000 gal ²
4	Liq cgo, SP, diesel, steel.....	273,000 gal ³
	Pipelines:	
		<i>Normal capacity⁴</i> <i>(bbl per day)</i>
5	4-in. ⁵	7,100.....
6	6-in.....	15,700.....
7	8-in.....	27,100.....
8	12-in.....	143,000.....
9	Railroad tk cars, petr.....	8,000; 10,000; 12,000 gal
10	36", 39½", 42" gage, foreign svc.....	6,000 gal
11	56½" gage, domestic svc, riveted or welded.....	10,000 gal
12	56½", 60", 63", 66" gage, foreign svc.....	10,000 gal
13	Ships (supertanker).....	262 to 870 million bbl
14	Ships (large tanker).....	60 to 262 million bbl ⁶
15	Ships (small tanker).....	14 to 48 million bbl ⁷
	Storage tanks:	
16	Bolted steel.....	100; 250; 500; 1,000; 3,000; 10,000 bbl
17	Collapsible, fabric, ptbl.....	900; 3,000; 10,000 gal
18	Liq stor, metal, for POL, horizontal, W skids.....	600 gal
19	SUPPT assemblage, bulk petr products.....	60,000 gal
20	Tk, liq dispensing, tlr-mtd.....	600 gal
21	Transporter, liq, rolling-wheel type.....	1,000 gal
22	Trk, tk, fuel svc, 2½-ton, 6x6.....	1,200 gal
23	Trk, tractor, 5-ton, 6x6, SWB, WWN, W stlr, tk, gas, 5,000-gal, 4-wheel.....	5,000 gal
24	Vessel, liq cgo, SP, diesel, steel, 210-ft, design 7014.....	483,000 gal

¹ Rectangular hulls.

² 6 x 18 ponton barge, carrying three 42,000-gal tanks loaded to two-thirds capacity.

³ Molded hulls.

⁴ Computed on an average operating day of 20 hr.

⁵ Nominal size.

⁶ The ship tanker most commonly used is the T2-SE-A1, a 5,922,000-gal tanker. It is 524 ft long and draws 31 ft. It has three 8-in. flanged discharge outlets and four discharge pumps rated 1,000 GPM at 100 psi.

⁷ Draft loaded, 12 to 20 ft.

1	Product	Packaging	Wt (lb)	Cubic ft		Planning factor	Conversion factors		Gal per long short ton	Gal per long measure-ton	Bbl per long short ton	Pack-ages per long short ton	Pack-ages per long measure-ton	Packs per measurement	Capacity of vehicles for carrying filled containers ²		17
				Actual	Planing		Gal to lb	Cal to gal							1½-ton truck	2½-ton truck	
2	Aviation gasoline	Bulk	55-gal drums ³	373.0	9.03	11	6.91	0.145	289.4	324.2	187.8	5.36	6.00	3.48	8	14	28
		55-gal drums ⁴	389.0	8.80	11	7.20	0.139	277.8	311.1	192.8	5.14	5.76	3.57	8	13	26	
3	Jet fuel (JP-4)	Bulk	55-gal drums ³	399.0	9.03	11	7.39	0.135	270.0	302.4	187.8	5.01	5.61	3.48	8	13	25
		55-gal drums ⁴	415.0	8.80	11	7.68	0.130	260.0	291.2	192.7	4.82	5.40	3.57	8	12	24	
4	Motor gasoline	Bulk	55-gal drums ³	384.0	9.03	11	7.11	0.141	281.2	315.1	187.8	5.21	5.83	3.48	8	13	26
		55-gal drums ⁴	400.0	8.80	11	7.41	0.135	269.9	302.3	192.8	5.00	5.60	3.57	8	13	26	
5	Diesel fuel	Bulk	55-gal drums ³	432.0	9.03	11	8.00	0.125	250.0	280.0	187.8	4.63	5.19	3.48	7	12	24
		55-gal drums ⁴	448.0	8.80	11	8.30	0.120	241.0	269.9	192.7	4.46	5.00	3.57	7	12	24	
6	Kerosene	Bulk	55-gal drums ³	421.0	9.03	11	7.80	0.128	256.4	287.1	187.8	4.75	5.32	3.48	8	12	24
		55-gal drums ⁴	437.0	8.80	11	8.09	0.124	247.2	276.9	192.8	4.58	5.13	3.57	7	12	24	
7	Lubricating oils	Bulk	55-gal drums ³	472.0	9.03	11	8.58	0.117	233.1	261.0	191.3	4.24	4.75	3.48	7	11	22
		55-gal drums ⁴	488.0	8.80	11	8.87	0.113	225.5	252.5	196.4	4.10	4.59	3.57	7	11	22	
8	Circulants	25-lb pails	29.0	0.95	1										104	173	346
		5-lb cans (6/case)	44.0	1.10	2										69	114	227
9	Fog oils	Bulk	55-gal drums ³	438.0	9.03	11	8.11	0.123	246.6	276.2	191.3	4.50	5.02	3.48	7	11	22
		55-gal drums ⁴	458.0	8.80	11	8.10	0.123	246.9	276.5	184.6	4.32	4.84	3.57	7	11	22	
10	SGF2	Bulk	55-gal drums ³	431.0	9.03	11	7.99	0.120	250.3	280.3	191.3	4.54	5.09	3.48	7	11	22
		55-gal drums ⁴	478.0	8.80	11	8.28	0.120	241.5	270.5	196.4	4.39	4.90	3.57	7	11	22	

¹For ocean-shipping, storage, and pipeline computations, bulk petroleum products usually are measured in bbl of 42 gal each or in long tons. Based on authorized loads in short tons. When overloads are authorized, these quantities may be increased to the cubic capacity of the vehicle or to 100 percent over-weight, whichever limit is reached first.

²18-gal standard—weights 54 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

³18-gal standard—weights 70 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

⁴For planning purposes, weight of gasoline may be taken as 42 lb and weight of lubricating oil for engines as 50 lb per 5-gal can, including weight of can. Cans, 5-gal, weight approximately 11 lb empty.

*Factors in this table are based on U S gal

5.15. Weights, Volumes, and Conversion Factors for Petroleum Products*

5.16. Estimating Class III Requirements

a. *Estimating Solid Fuel Requirements.* The factors given below are based on the use of coal only, assuming use of no petroleum products or gas. When firewood or peat is substituted, 2 pounds of such fuel is required in lieu of 1 pound of coal. Factors are applicable to temperate climate.

(1) Utilities.

Space, water heating, and cooking, per man per day.	4 lb
Cooking only, per man per day.	1.5 lb
Hospital use, per bed per day:	
Winter -----	12 lb
Summer -----	5 lb
Railroad engine, per mile of travel on flat to hilly terrain.	100 lb
Coffee roaster, per unit per day.	400 lb
Laundry, fixed, per unit per day.	32 short tons

(2) Steam locomotives (coal-burning).

	1	2	3	4
1	Type of locomotive	Type of operation	Estimated average rate of coal consumption	
			Pounds/ train-mile	Pounds/ hour
2	2-8-0 standard gage.....	Road..	90	700
3	2-8-2 narrow gage.....	Road..	100	750

(a) In estimating coal requirements, it is recommended that 10 percent be added to computed rate of consumption to allow for contingencies.

(b) For general planning purposes, assume operation of switch engines for 20 hours a day; allow 4 hours a day for maintenance.

b. *Estimating Gasoline Requirements.* The major factors controlling gasoline requirements in military operations are as follows:

(1) *Displacement.* By measuring the distance that the center of mass is moved, the average mileage moved by each vehicle is determined. Administrative

or march movements are computed on the basis of using available road nets. Movements under battle conditions are computed on the basis of selected elements of the organization proceeding cross country. Experience tables provide consumption data on a mileage basis for moving an organization. For planning purposes, it is assumed that cross-country battle consumption is at a rate of 2.5 times that given for road movements in the gasoline and oil supply data tables (pars. 5.17-5.24).

(2) *Supply.* During a displacement, certain vehicles of an organization must make round trip supply hauls. Since these hauls generally are made to supply points located at varying distances from the organization, an average round trip supply distance must be determined. Experience indicates that daily requirements for supply hauls are approximately equal to 10 percent of the total organizational consumption per mile of displacement multiplied by the average round trip supply distance. When the organization is not on the move, supply haul requirements are included in the composite requirement described in (4) below and are not computed separately.

(3) *Service.* Supplemental daily requirements exist for such purposes as movement of vehicles within bivouac areas and on reconnaissance, warming up engines, and abnormal periods of low-gear operation. These items will differ with the nature of the operation, weather, roads, and terrain and must be estimated in accordance with general conditions. Under average conditions, these requirements can be estimated by using the consumption necessary to move all vehicles in the organization 10 miles over roads. This factor applies when the organization is on the march or in combat.

(4) *Housekeeping.* Additional daily requirements exist for administrative vehicles, kitchens, gasoline-powered equipment, and maintenance and testing of engines. When the organization is not on the march, these requirements are grouped in a composite daily requirement as noted under each gasoline and oil supply data table. When the organization is on the move, the requirements for administrative vehicles (not supply hauls) and gasoline-powered equipment are absorbed by maintenance and testing factor is absorbed by the service factor; but the kitchen requirement must be added on the basis of a daily consumption per kitchen of 15 gallons of gasoline.

(5) *Wastage.* This factor covers evaporation, spillage, and small combat losses. It is applied only to road movement in the combat zone. It is computed as 10 percent of the sum of all other consumption figures.

(6) *Example.* An armored division (par. 5.18) is to make the following movement: 1st day—90 miles in zone to bivouac area at field army rear boundary; 2d day—no movement; 3d day—60 miles forward in combat zone; and 4th day—10 miles, with 8 miles under cross-country battle conditions for all elements except the division trains. Average round trip supply distances are: 1st day—30 miles; 2d day—20 miles; 3d day—40 miles; and 4th day—30 miles. Estimate gasoline requirements for the 4-day period.

Caution: Refer to notes at foot of gasoline and oil supply data tables (pars. 5.17-5.24) for supplemental information and data necessary to determine complete solutions of estimated requirements.

1st day
(a) Multiply 90 (displacement) by 2,079 (gal per mile). = 187,110

1st day
(b) Multiply 30 (supply distance) by 208 (10% of division consumption per mile). = 6,240
(c) Multiply 10 by 2,079 to account for service requirements. = 20,790
(d) Multiply 15 (gal) by 98 (organic kitchens). = 1,470

2d day
(e) From footnote 2, paragraph 5.18. = 3,000

3d day
(f) Multiply 80 (displacement) by 2,079 (gal per mile). = 166,320
(g) Multiply 40 (supply distance) by 208 (10% of division consumption per mile). = 8,320
(h) Multiply 10 by 2,079 to account for service requirements. = 20,790
(i) Multiply 15 (gal) by 98 (organic kitchens). = 1,470
(j) Take 10% of (f) + (g) + (h) + (i) above, to account for wastage. = 19,690

4th day
(k) Multiply 2 (road displacement) by 2,079 (gal per mile). = 4,158
(l) Multiply 8 (road displacement) by 109 (gal per mile for division trains). = 872
(m) Multiply 8 (cross-country battle displacement) by 1,943 (gal per mile for combat units) by 2.5 (cross-country battle factor). = 38,860
(n) Multiply 30 (supply distance) by 208 (10% of division consumption per mile). = 6,240
(o) Multiply 10 by 2,079 to account for service requirements. = 20,790
(p) Multiply 15 (gal) by 98 (organic kitchens). = 1,470
(q) Take 10% of (k) + (o) + (l) + (n) (p) above, to account for wastage. = 3,353

(r) Total estimate for 4 days—add (a) through (q) above. = 510,943 or 510,950 gal.

(7) *Computing aviation fuel requirements.* Aviation fuel requirements are computed separately for each type aircraft by the following formula:

$$\text{Total fuel rqr by type acft} = \frac{\text{No. acft by type} \times \text{avg consumption/hr in gal} \times \text{dis to be flown}}{\text{Avg speed of acft}}$$

c. *Per-Man-Per-Day Method of Estimating Petroleum Requirements.* The per-man-per-day method of estimating petroleum requirements is used in the early planning stages when definitive information is not available on the number and types of vehicles. Because of the variables in organizational composition, this method is seldom used below field army level and never below corps level; although, once established for a given theater, the figure may be used for requisitioning purposes by smaller units. It is emphasized that the gallons-per-man-per-day method is to be used as a guide only and not as a substitute for more exacting computation. The consumption in gallons per man per day in various theaters will necessarily vary with terrain, climate, ratio between land and amphibious operations, and the employment of

units using special vehicles and equipment. The figures given in the following tables should be adjusted to fit each particular area as soon as experience shows any variance between these planning factors and actual usage. To compute estimated petroleum requirements, multiply troop strength by factors listed below.

(1) *Army class III supplies.*

	1	2	3
	Product	Gal per man per day	Pounds per man per day
2	MOGAS (90%).....	3.000	18.309
3	Diesel (4%).....	0.132	0.928
4	Engine oil (3%).....	0.099	0.714
5	Gear lubricants (1%).....	0.033	0.250
6	Grease (expressed in lb).....		0.066
7	Total.....		20.267

(2) *Army class III (A) supplies.*¹

	1	2	3
	Product	Gal per man per day	Pounds per man per day
2	AVGAS 100/130.....	0.300	1.778
3	AVLUB oils.....	0.003	0.220

¹ Air Force requirements for class III (A) supplies must be obtained from the appropriate Air Force command.

5.17. Gasoline and Oil Supply Data—Airborne Division (TOE 57D)^{1 2}

	1	2	3	4	5	6	7	8	9
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			
		Vehicles fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease, miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Total vehicle tanks and vehicle cans, 5-gal	Others cans, 5-gal (kitchens, generators, heaters, etc.)
2	Comd and con bn.....	1,469.0	35.0	42.2	35.0	3,389	995	4,384	450
3	HQ & HQ co.....	(367.7)	(8.8)	(9.6)	(8.8)	(834)	(260)	(1,094)	(125)
4	Admin co.....	(171.0)	(4.0)	(6.0)	(4.0)	(420)	(100)	(520)	(210)
5	Avn co ²	(446.1)	(9.0)	(13.0)	(9.0)	(983)	(295)	(1,278)	(100)
6	Cav trp.....	(484.2)	(13.2)	(13.6)	(13.2)	(1,152)	(340)	(1,492)	(15)
7	5 abn BG (ea).....	1,431.8	46.4	40.8	42.2	2,527	525	3,052	205
8	HQ & HQ co.....	(737.6)	(26.6)	(21.0)	(22.4)	(1,692)	(420)	(2,112)	(135)

See footnotes at end of table.

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	1	2	3	4	5	6	7	8	9
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			
1		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease, miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Total vehicle tanks and vehicle cans, 5-gal	Others cans, 5-gal (kitchens, generators, heaters, etc.)
9	5 rifle co (ea)-----	(87.5)	(2.6)	(2.6)	(2.6)	(113)	(5)	(118)	(5)
10	Mort btry-----	(256.7)	(6.8)	(6.8)	(6.8)	(270)	(80)	(350)	(45)
11	Div arty-----	2,020.1	40.6	47.4	40.6	4,409	1,505	5,914	285
12	HQ & HQ btry-----	(498.0)	(10.4)	(13.2)	(10.4)	(1,122)	(350)	(1,472)	(115)
13	5 FA how btry, 105-mm (ea).	(201.7)	(4.0)	(4.4)	(4.0)	(433)	(155)	(588)	(25)
14	FA msl btry, 762-mm rkt.	(513.6)	(10.2)	(12.2)	(10.2)	(1,122)	(380)	(1,502)	(45)
15	Engr bn-----	2,714.6	57.0	53.7	63.0	2,645	995	3,640	275
16	HQ & HQ co-----	(2,146.8)	(44.2)	(38.5)	(50.2)	(1,551)	(705)	(2,256)	(135)
17	2 engr co (ea)-----	(283.9)	(6.4)	(7.6)	(6.4)	(547)	(145)	(692)	(70)
18	Sig bn-----	782.7	14.6	15.4	14.6	1,592	600	2,192	385
19	HQ & HQ det-----	(55.1)	(1.0)	(1.0)	(1.0)	(113)	(45)	(158)	(40)
20	Comd op co-----	(425.0)	(8.0)	(8.4)	(8.0)	(847)	(315)	(1,162)	(135)
21	Fwd comm co-----	(302.6)	(5.6)	(6.0)	(5.6)	(632)	(240)	(872)	(210)
22	Spt gp-----	2,931.0	57.4	80.8	61.8	6,409	1,860	8,269	35,825
23	HQ & HQ det-----	(81.7)	(2.0)	(2.4)	(2.0)	(193)	(45)	(238)	(55)
24	QM preht sup and maint co.	(241.3)	(4.6)	(3.6)	(4.6)	(541)	(100)	(641)	(145)
25	Sup and transport co.	(910.3)	(18.0)	(30.4)	(18.0)	(2,123)	(495)	(2,618)	3(5,090)
26	Med co-----	(659.0)	(12.0)	(17.6)	(16.4)	(1,376)	(520)	(1,896)	(330)
27	Maint bn-----	(1,038.7)	(20.8)	(26.8)	(20.8)	(2,176)	(700)	(2,876)	(205)
28	HQ & main spt co.	(411.7)	(9.0)	(13.8)	(9.0)	(961)	(215)	(1,176)	(195)
29	Emerg rep co-----	(627.0)	(11.8)	(13.0)	(11.8)	(1,215)	(485)	(1,700)	(10)
30	Total abn div-----	17,076.4	436.6	443.5	426.0	31,079	8,580	39,659	8,245

¹ Includes augmentations for all units, except FA msl btry, 762-mm rkt.

² Does not include data for Army aircraft.

³ Includes capacity of 1,000 5-gal cans, class III reserve.

5.18. Gasoline and Oil Supply Data—Armored Division (TOE 17D)^{1 2 3 4 5 6 7 8}

	1	2	3	4	5	6	7	8	9	10	11	12	13
		Fuel and lubricant requirements, motor vehicle consumption in moving vehicles 100 miles				Gasoline capacity (gal)				Fuel can data			
1	Unit	Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease, miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Bulk tankers	Total vehicle tanks; vehicle cans, 5-gal; bulk tankers	How transported		Total cargo transportation, individual wheeled vehicles	Organic kitchens
										Cargo transportation	Individual wheeled vehicles		
2	HQ & HQ co, armd div	881	22.8	19.4	19.0	1,837	220		2,057		44	44	2
3	3 Hq & Hq co, CC (ea)	1,388	28.6	12.6	21.0	2,114	1,690		3,804	310	28	338	1
4	Avn co	865	17.6	30.6	20.2	2,266	310	4,800	7,376		62	62	1
5	Trans acft maint det	153	3.2	5.1	3.4	382	45		427		9	9	
6	MP co	419	11.0	12.7	11.5	1,036	260		1,296		52	52	1
7	4 inf bn (ea)	11,327	218.6	47.3	205.4	14,935	9,360	4,800	29,095	1,778	94	1,872	5
8	HQ & HQ co	(2,923)	(59.8)	(29.7)	(53.0)	(4,703)	(9,240)	(4,800)	(18,743)	(1,778)	(70)	(1,848)	(1)
9	4 rifle co (ea)	(2,101)	(39.7)	(4.4)	(38.1)	(2,558)	(30)		(2,588)		(6)	(6)	(1)
10	4 armor bn, 90-mm (ea)	23,141	475.6	197.3	163.8	31,904	14,475	7,200	53,579	2,790	105	2,895	5
11	HQ & HQ co	(4,337)	(90.8)	(44.5)	(64.2)	(7,100)	(14,375)	(7,200)	(28,675)	(2,790)	(85)	(2,875)	(1)
12	4 med tk co (ea)	(4,701)	(96.2)	(38.2)	(24.9)	(6,201)	(25)		(6,226)		(5)	(5)	(1)
13	Cav sq	10,213	268.0	107.4	183.6	15,309	13,115	7,200	35,624	2,480	143	2,623	5
14	HQ & HQ trp	(2,797)	(65.6)	(35.4)	(48.8)	(4,789)	(12,695)	(7,200)	(24,684)	(2,480)	(59)	(2,539)	(1)
15	4 armd cav trp (ea)	(1,854)	(50.6)	(18.0)	(33.7)	(2,630)	(105)		(2,735)		(21)	(21)	(1)
16	Div arty	25,364	540.9	324.1	434.1	37,679	14,820	9,600	62,099	2,480	484	2,964	22
17	HQ & HQ btry	(900)	(18.8)	(20.3)	(20.7)	(1,919)	(250)		(2,169)		(50)	(50)	(1)
18	3 FA how bn, 105-mm, SP (ea)	(5,962)	(130.5)	(72.4)	(100.9)	(8,475)	(3,615)	(2,400)	(14,490)	(620)	(103)	(723)	(5)
19	HQ & HQ btry	(1,042)	(20.6)	(12.9)	(22.1)	(1,770)	(180)		(1,950)		(36)	(36)	(1)
20	3 FA how btry, 105-mm, SP (ea)	(1,311)	(31.4)	(14.6)	(21.6)	(1,696)	(75)		(1,771)		(15)	(15)	(1)
21	Svc btry	(987)	(15.7)	(15.7)	(14.0)	(1,617)	(3,210)	(2,400)	(7,227)	(620)	(22)	(642)	(1)
22	FA bn, 155-mm, 8-in. how, 762-mm rkt, SP	(6,578)	(130.6)	(86.6)	(110.7)	(10,335)	(3,725)	(2,400)	(16,460)	(620)	(125)	(745)	(6)
23	HQ & HQ btry	(661)	(12.8)	(10.7)	(14.3)	(1,205)	(140)		(1,345)		(28)	(28)	(1)

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving vehicles 100 miles				Gasoline capacity (gal)				Fuel can data			Organic kitchen
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease, miscellaneous (lb)	Vehicle tanks	Vehicle cans 5-gal	Bulk Bulk tankers	Total vehicle tanks; vehicle cans, 5-gal; bulk tankers	How transported		Total Cargo transportation, individual wheeled vehicles	
										cargo transportation	Individual wheeled vehicles		
24	2 FA how btry, 155-mm, SP (ea)-----	(1,408)	(30.4)	(15.5)	(23.0)	(1,813)	(80)	-----	(1,893)	-----	(16)	(16J)	(1)
25	FA how btry, 8-in, SP---	(1,501)	(26.4)	(15.2)	(22.8)	(2,528)	(80)	-----	(2,608)	-----	(16)	(16)	(1)
26	FA msl btry, 762-mm rkt, SP---	(607)	(12.4)	(13.0)	(12.6)	(1,347)	(145)	-----	(1,492)	-----	(29)	(29)	(1)
27	Svc btry-----	(993)	(18.2)	(16.5)	(15.0)	(1,629)	(3,200)	(2,400)	(7,229)	(620)	(20)	(640)	(1)
28	Engr bn-----	14,490	292.8	133.0	187.8	24,007	985	7,200	32,192	-----	197	197	6
29	HQ & HQ co-----	(2,117)	(21.4)	(35.7)	(34.2)	(4,414)	(315)	(1,200)	(5,929)	-----	(63)	(63)	(1)
30	4 engr eo (ea)---	(2,172)	(44.9)	(14.1)	(29.8)	(3,340)	(85)	(1,200)	(4,625)	-----	(17)	(17)	(1)
31	Brg co-----	(3,685)	(71.8)	(40.9)	(34.4)	(6,233)	(330)	(1,200)	(7,763)	-----	(66)	(66)	(1)
32	Sig bn-----	2,553	54.0	83.5	60.6	6,754	805	1,200	8,759	-----	161	161	3
33	HQ & HQ co-----	(757)	(17.6)	(30.6)	(17.9)	(2,446)	(255)	(1,200)	(3,901)	-----	(51)	(51)	(1)
34	Comd op co-----	(1,182)	(23.8)	(31.4)	(26.6)	(2,710)	(315)	-----	(3,025)	-----	(63)	(63)	(1)
35	Fwd comm co-----	(614)	(12.6)	(21.5)	(16.1)	(1,598)	(235)	-----	(1,833)	-----	(47)	(47)	(1)
36	Div tn-----	10,913	219.6	259.3	202.2	25,767	33,310	96,000	155,077	6,216	446	6,662	15
37	HQ & HQ det and band-----	(154)	(3.4)	(5.6)	(3.6)	(4.3)	(60)	-----	(473)	-----	(12)	(12)	(1)
38	QM bn-----	(4,181)	(88.8)	(99.5)	(75.3)	(11,478)	(30,845)	(96,000)	(138,323)	(6,000)	(169)	(6,169)	(2)
39	HQ & HQ det-----	(84)	(1.8)	(2.2)	(2.2)	(191)	(45)	-----	(236)	-----	(9)	(9)	-----
40	Sup co-----	(2,096)	(40.0)	(64.1)	(39.8)	(6,468)	(420)	(96,000)	(102,888)	-----	(84)	(84)	(1)
41	Fld svc co-----	(2,091)	(47.0)	(33.2)	(33.3)	(4,819)	(30,380)	-----	(35,199)	(6,000)	(76)	(6,076)	(1)
42	Ord bn-----	(5,246)	(97.8)	(107.6)	(89.9)	(10,266)	(1,850)	-----	(12,116)	(216)	(154)	(370)	(4)
43	HQ & main spt co-----	(1,838)	(29.7)	(39.5)	(29.0)	(3,750)	(305)	-----	(4,055)	-----	(61)	(61)	(1)
44	3 fwd spt co (ea)-----	(1,136)	(22.7)	(22.7)	(20.3)	(2,172)	(515)	-----	(2,268)	(72)	(31)	(103)	(1)
45	Med bn-----	(1,156)	(25.4)	(39.4)	(29.0)	(3,085)	(485)	-----	(3,570)	-----	(97)	(97)	(5)
46	HQ & HQ det-----	(221)	(5.6)	(7.9)	(5.5)	(669)	(90)	-----	(759)	-----	(18)	(18)	(1)
47	Amb co-----	(550)	(11.0)	(14.6)	(14.2)	(1,215)	(270)	-----	(1,485)	-----	(54)	(54)	-----
48	Clr co-----	(358)	(8.8)	(16.9)	(9.3)	(1,201)	(125)	-----	(1,326)	-----	(25)	(25)	(4)
49	Admin co-----	(176)	(4.2)	(7.2)	(4.4)	(525)	(70)	-----	(595)	-----	(14)	(14)	(3)
50	Total armd div-	207,887	4,292.5	1,991.3	2,662.2	308,735	164,280	174,000	647,015	30,378	2,478	32,856	98

¹ Data contained in this table are recommended for *planning purposes only* and are subject to continuous revision.

² When the div is not on the march, 3,000 gal of fuel per day are required for administrative vehicles, kitchens, and gasoline-powered equipment.

³ For cross-country battle conditions, fuel and lubricant consumption figures are multiplied by 2.5. (The 10 percent handling factor need not be applied when this factor is used.)

⁴ Fuel can data include those containers that can be transported in organic cargo transportation and on the individual fuel-can brackets mounted on each wheeled vehicle. Additional fuel cans must be procured for stoves, kitchens, and gasoline-powered equipment as required.

⁵ These data are computed on the basis of TOE ord vehicles and other technical service vehicular-mounted equipment and the use of the M48A2 tank and M59 APC.

⁶ These data do not include the augmentation of nine 5,000-gal tankers, authorized by TOE 10-47D, in the QM bn.

⁷ Does not include data for Army aircraft.

⁸ When computing division requirements based on the M60 tank, see paragraph 5.13. The following ratios of diesel carriers to gasoline carriers will apply:

a. Within armor bn, 90-mm—one gasoline tanker to two diesel tankers.

b. Within QM bn—three gasoline tankers to one diesel tanker.

5.19. Gasoline and Oil Supply Data—Infantry Division (TOE 7D)^{1 2 3 4 5 6 7 8 9}

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of TA 5-gal fuel cans			Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal; tankers, 1,200- and 5,000-gal	Total vehicle tanks; vehicle cans, 5-gal, tankers 1,200- and 5,000-gal	Resupply kitchens, airplanes, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
2	HQ & HQ co, inf div.....	365.0	10.8	12.1	11.6	1,015	470	1,485	33	61	94	3
3	5 inf BG (ea) ^{10 11}	2,020.7	52.7	52.2	50.2	4,954	1,665	6,619	64	269	333	7
4	HQ & HQ co ¹¹	(927.7)	(25.6)	(28.9)	(23.9)	(1,999)	(875)	(2,874)	(42)	(133)	(175)	(1)
5	5 rifle co (ea).....	(72.4)	(1.8)	(2.2)	(2.2)	(181)	(80)	(261)	(3)	(13)	(16)	(1)
6	Cmbt spt co ¹⁰	(731.0)	(18.1)	(12.3)	(15.3)	(2,050)	(390)	(2,440)	(7)	(71)	(78)	(1)
7	Div arty ^{10 12}	10,470.5	293.5	283.9	269.7	24,989	11,565	36,554	380	1,213	1,593	19
8	HQ & HQ btry.....	(567.6)	(14.8)	(26.0)	(18.9)	(1,706)	(655)	(2,361)	(33)	(98)	(131)	(1)
9	3 FA how bn, 105-mm and 155-mm, towed (ea) ¹²	(1,418.1)	(37.4)	(39.7)	(35.8)	(3,320)	(1,625)	(4,945)	(61)	(184)	(245)	(3)
10	HQ & HQ btry ¹²	(587.7)	(14.6)	(16.7)	(14.1)	(1,532)	(1,010)	(2,542)	(42)	(80)	(122)	(1)
11	FA how btry, 105-mm, towed.....	(239.8)	(6.2)	(9.2)	(5.8)	(705)	(210)	(915)	(9)	(33)	(42)	(1)
12	FA how btry, 155-mm, towed.....	(590.6)	(16.6)	(13.8)	(15.9)	(1,083)	(405)	(1,488)	(10)	(71)	(81)	(1)
13	2 FA how bn, 105-mm and 155-mm, SP (ea) ^{10 12}	(2,024.9)	(66.1)	(46.3)	(52.5)	(4,547)	(1,725)	(6,272)	(53)	(172)	(225)	(3)
14	HQ & HQ btry ^{10 12}	(842.9)	(20.3)	(19.7)	(17.8)	(1,903)	(1,195)	(3,098)	(35)	(84)	(119)	(1)
15	FA how btry, 105-mm, SP ¹⁰	(562.0)	(28.8)	(13.1)	(18.6)	(1,505)	(140)	(1,645)	(9)	(19)	(28)	(1)
16	FA how btry, 155-mm SP.....	(620.0)	(17.0)	(13.5)	(16.1)	(1,139)	(390)	(1,529)	(9)	(69)	(78)	(1)
17	FA bn, 762-mm rkt, SP, 8-in. how, towed ¹²	(1,598.8)	(34.3)	(46.2)	(38.4)	(4,229)	(2,585)	(6,814)	(58)	(219)	(277)	(3)
18	HQ & HQ btry ¹²	(688.8)	(16.1)	(22.0)	(17.9)	(1,650)	(1,780)	(3,430)	(28)	(88)	(116)	(1)

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of TA 5-gal fuel cans			Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal; tankers, 1,200- and 5,000-gal	Total vehicle tanks; vehicle cans, 5-gal, tankers 1,200- and 5,000-gal	Resupply kitchens, airplanes, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
19	FA how btry, 8-in., towed.....	(412.2)	(7.4)	(9.2)	(8.7)	(1,295)	(425)	(1,720)	(10)	(75)	(85)	(1)
20	FA msl btry, 762-mm rkt, SP.....	(497.8)	(10.8)	(15.0)	(11.8)	(1,284)	(380)	(1,664)	(20)	(56)	(76)	(1)
21	Armor bn, 90-mm ¹³	27,824.2	882.0	542.2	660.3	38,071	14,505	52,576	2,790	111	2,901	6
22	HQ & HQ co.....	(4,319.2)	(127.5)	(72.7)	(82.8)	(7,066)	(14,380)	(21,466)	(2,790)	(86)	(2,876)	(1)
23	5 med tk co (ea).....	(4,701.0)	(150.9)	(93.9)	(115.5)	(6,201)	(25)	(6,226)	-----	(5)	(5)	(1)
24	Cav sq.....	8,342.0	203.1	99.9	153.6	12,635	9,190	21,825	1,716	122	1,838	4
25	HQ & HQ trp.....	(2,777.0)	(81.0)	(45.9)	(52.5)	(4,745)	(8,875)	(13,620)	(1,716)	(59)	(1,775)	(1)
26	3 armd cav trp (ea).....	(1,855.0)	(40.7)	(18.0)	(33.7)	(2,630)	(105)	(2,735)	-----	(21)	(21)	(1)
27	Avn co.....	2,025.5	61.7	26.8	18.6	6,911	1,370	8,281	166	108	274	1
28	Trans acft maint det.....	143.2	3.0	5.1	3.4	420	100	520	-----	20	20	-----
29	Engr bn ^{11 12}	5,404.6	125.4	105.5	99.8	12,632	5,400	18,032	333	507	840	6
30	HQ & HQ co ^{11 12}	(3,422.6)	(69.4)	(52.0)	(49.3)	(4,987)	(2,850)	(7,837)	(138)	(192)	(330)	(1)
31	5 engr co (ea).....	(396.4)	(11.2)	(10.7)	(10.1)	(1,529)	(510)	(2,039)	(39)	(63)	(102)	(1)
32	Sig bn.....	2,078.4	50.8	88.4	58.9	6,105	3,090	9,195	280	338	618	3
33	HQ & HQ co.....	(524.0)	(14.0)	(24.2)	(14.7)	(1,654)	(1,100)	(2,754)	(140)	(80)	(220)	(1)
34	Comd op co.....	(821.6)	(20.2)	(35.1)	(23.5)	(2,412)	(1,120)	(3,532)	(90)	(134)	(224)	(1)
35	Fwd comm co.....	(732.8)	(16.6)	(29.1)	(20.7)	(2,039)	(870)	(2,909)	(50)	(124)	(174)	(1)
36	Div tn ¹⁴	9,809.8	202.3	241.1	250.2	24,247	66,655	90,902	394	739	1,133	14
37	HQ & HQ det and band.....	(90.2)	(2.4)	(3.5)	(2.7)	(257)	(135)	(392)	(12)	(15)	(27)	(1)
38	Admin co.....	(122.2)	(3.4)	(5.6)	(3.6)	(383)	(315)	(698)	(44)	(19)	(63)	(2)
39	QM co ¹⁴	(772.0)	(22.2)	(40.1)	(23.3)	(2,876)	(62,255)	(65,131)	(131)	(120)	(251)	(1)
40	Ord bn.....	(1,837.2)	(42.9)	(49.0)	(38.5)	(4,759)	(1,480)	(6,239)	(67)	(229)	(296)	(2)
41	Hq & main spt Co.....	(654.6)	(17.4)	(25.8)	(17.0)	(2,127)	(655)	(2,782)	(28)	(103)	(131)	(1)
42	Fwd spt co.....	(1,182.6)	(25.5)	(23.2)	(21.5)	(2,632)	(825)	(3,457)	(39)	(126)	(165)	(1)
43	Med bn.....	(610.6)	(13.4)	(63.4)	(78.8)	(1,545)	(1,025)	(2,570)	(96)	(109)	(205)	(4)
44	HQ & HQ det.....	(82.0)	(2.2)	(2.7)	(2.5)	(224)	(155)	(379)	(17)	(14)	(31)	(1)
45	Amb co.....	(405.6)	(8.0)	(54.8)	(72.8)	(932)	(395)	(1,327)	(5)	(76)	(79)	-----
46	Clr co.....	(123.0)	(3.2)	(5.9)	(3.5)	(389)	(475)	(864)	(76)	(19)	(95)	(3)
47	Trans bn ¹¹	(6,377.6)	(118.0)	(79.5)	(103.3)	(14,427)	(1,445)	(15,872)	(44)	(247)	(291)	(4)
48	HQ & HQ co.....	(603.6)	(15.0)	(12.9)	(11.7)	(1,086)	(515)	(1,601)	(31)	(74)	(105)	(1)
49	Trk transport co.....	(1,166.0)	(33.0)	(65.0)	(33.0)	(4,085)	(850)	(4,935)	(5)	(165)	(170)	(1)
50	2 armd carr co (ea) ¹⁰	(2,304.0)	(35.0)	(0.8)	(29.3)	(4,628)	(40)	(4,668)	(4)	(4)	(8)	(1)
51	Total inf div.....	76,566.7	2,096.1	1,666.0	1,777.1	151,795	120,670	272,465	6,412	4,564	10,976	91

¹ When the div is not on the march, approximately 4,000 gal of fuel per day are required for administrative vehicles, kitchens, and gasoline-powered equipment. This figure includes wastage and warmup factors.

² When figured separately, daily gasoline consumption per kitchen is 15 gal.

³ For cross-country battle conditions, vehicle fuel and lubricant consumption figures are multiplied by 2.5. (The 10 percent wastage factors need not be applied when this factor is used.)

⁴ 1,100 gal of gasoline is required to operate all stationary gasoline-consuming equipment for 1 hour; i.e., generators, battery chargers, kitchens, etc.

⁵ 130 gal of diesel fuel is required to operate all diesel-powered equipment in the division for 1 hour.

⁶ Fuel-tank capacity for diesel-powered equipment is 1,500 gal, div total.

⁷ Tank-truck capacity (thirty-seven 1,200-gal tankers and five 5,000-gal semitrailers) is 69,400 gal.

⁸ Does not include data for Army aircraft.

⁹ Does not include class III requirements for electrical equipment power supply motors.

¹⁰ Fuel consumption data are based on the use of M113 APC.

¹¹ Additional round trips are computed for the 5-ton truck-tractors to return for four road graders and eight scoop-type loaders (one scoop-type loader per battle group; three scoop-type loaders and four road graders in the engr bn).

¹² Includes 1,200-gal tankers.

¹³ Gasoline consumption is based on the M48A2 tank and M59 APC.

¹⁴ Includes thirty 1,200-gal tankers and five 5,000-gal semitrailers.

5.20. Gasoline and Oil Supply Data—Armored Units (Nondivisional)^{1 2 3 4 5 6}

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)				Fuel can data, number of organic fuel cans			Organic kitchen
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease, miscellaneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Bulk tankers	Total vehicle tanks; vehicle cans, 5-gal; bulk tankers	Resupply, kitchens, airplanes, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
1	HQ & HQ co, armor gp-----	177	4.4	6.9	4.5	51.3	80	-----	593	-----	16	16	1
2	Armor bn, 90-mm (nondiv)-----	23,121	730.9	469.8	544.7	31,435	14,475	7,200	53,110	2,790	105	2,895	5
3	Armd cav regt-----	44,504	1,199.4	708.3	911.7	64,018	41,285	28,800	134,103	7,750	507	8,257	20
4	HQ & HQ trp-----	(679)	(21.7)	(15.8)	(21.5)	(1,600)	(175)	(3,600)	(5,375)	-----	(35)	(35)	(1)
5	3 armd cav sq (ea)-----	(14,368)	(387.5)	(221.6)	(291.1)	(20,481)	(13,105)	(7,200)	(40,786)	(2,480)	(141)	(2,621)	(6)
6	HQ & HQ trp-----	(2,703)	(78.6)	(48.3)	(51.9)	(4,587)	(12,695)	(7,200)	(24,482)	(2,480)	(59)	(2,539)	(1)
7	3 armd cav trp (ea)-----	(1,855)	(40.7)	(18.0)	(33.7)	(2,630)	(105)	-----	(2,735)	-----	(21)	(21)	(1)
8	Tk trp-----	(4,701)	(151.0)	(99.3)	(115.1)	(6,202)	(25)	-----	(6,227)	-----	(5)	(5)	(1)
9	FA how btry, 105-mm, SP-----	(1,399)	(35.8)	(20.0)	(23.0)	(1,802)	(70)	-----	(1,872)	-----	(14)	(14)	(1)
10	Avn co-----	(721)	(15.2)	(27.7)	(16.9)	(975)	(1,795)	(3,600)	(6,370)	(310)	(49)	(359)	(1)

¹ Refer to paragraph 5.166.

² Data contained in this table are recommended for *planning purposes only* and are subject to continuous revision.

³ For kitchens, estimated daily requirement is 15 gal.

⁴ Does not include data for Army aircraft.

⁵ Gasoline consumption is based on the M48A2 tank and M59 APC.

⁶ When computing gasoline requirements based on the M60 tank, see paragraph 5.13. Use the ratio of one gasoline tanker to two diesel tankers.

5.21. Gasoline and Oil Supply Data—Artillery Units (Nondivisional)*

a. Air Defense Artillery.^{1 2}

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of organic fuel cans			Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans 5-gal	Total vehicle tanks; vehicle cans, 5-gal	Resupply kitchens, airplanes, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
2	HQ & HQ btry, ADA bde.....	319.8	7.8	13.2	8.0	871	275	1,146	14	41	55	1
3	HQ & HQ btry, ADA gp.....	282.8	6.6	11.0	7.0	745	235	980	10	37	47	1
4	ADA AW bn, SP.....	8,686.0	282.6	135.8	153.4	11,833	2,575	14,408	56	459	515	5
5	ADA msl bn, HAWK (mbl).....	3,390.0	68.2	120.0	69.6	8,355	(³)	(³)	(³)	(³)	(³)	5
6	ADA msl bn, NIKE-HERCULES.....	3,375.0	89.6	116.4	90.1	9,145	(³)	(³)	(³)	(³)	(³)	5
7	ADA msl bn, NIKE-AJAX.....	3,621.0	76.6	112.2	70.2	10,247	2,930	13,177	241	345	586	5
8	ADA op det.....	126.0	2.8	5.0	3.0	332	110	442	6	16	22	1
9	ADA op det, MSL MONITOR.....	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)

¹ Fuel for operation of generators, etc., must be computed separately.

² Average daily gasoline consumption (net) is 15 gal per kitchen.

³ Data not available.

*For classified data pertaining to fuel requirements of free rockets and guided missiles, see FM 101-10, part III, paragraph 5.4.

b. Field Artillery.^{1 2 3 4}

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of organic fuel cans			Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrication (lb)	Grease miscellaneous (lb)	Vehicle tanks	Vehicle cans 5-gal	Total vehicle tanks; vehicle cans 5-gal	Resupply kitchens, airplanes, and miscellaneous	Motor vehicles	Total miscellaneous and motor vehicles	
2	HQ & HQ btry, army arty.....	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)	(⁵)
3	HQ & HQ btry, corps arty.....	570	4.0	5.0	4.0	1,395	500	1,895	4	96	100	1
4	HQ & HQ btry, FA gp.....	340	3.0	5.0	3.0	825	320	1,145	2	62	64	1
5	FA how bn, 105-mm, towed.....	5,040	16.0	15.0	7.0	2,155	2,060	4,215	21	381	402	5
6	FA how bn, 105-mm, SP.....	3,164	66.3	73.3	76.3	6,090	4,530	10,620	769	137	906	5
7	FA how bn, 155-mm, towed.....	2,670	75.9	86.9	80.9	5,337	2,725	8,062	164	381	545	5
8	FA how bn, 155-mm, SP.....	7,850	25.0	15.0	8.0	13,585	5,745	19,330	40	1,109	1,149	5
9	FA how bn, 8-in., towed.....	3,550	17.0	15.0	8.0	7,145	4,505	11,650	41	860	901	5
10	FA how bn, 8-in., SP.....	5,250	18.0	15.0	8.0	9,905	4,025	13,930	41	764	805	5

11	FA msl bn, CORPORAL.....	4,235	12.0	15.0	8.0	5,175	1,410	6,585	1	281	282	1
12	FA msl bn, HONEST JOHN rkt, SP.....	1,090	6.0	10.0	6.0	2,105	1,015	3,120	1	202	203	1
13	FA msl bn, LACROSSE, SP.....	1,275	8.0	15.0	8.0	2,975	(5)	2,975	(5)	(5)	(5)	1
14	FA gun bn, 280-mm.....	3,715	16.0	20.0	9.0	6,990	4,825	11,815	24	941	965	4
15	FA obsn bn.....	2,122	49.8	77.2	54.9	5,427	1,725	7,152	7	338	345	4
16	FA slt btry.....	625	12.0	23.0	13.0	1,500	475	1,975	2	93	95	1
17	FA msl gp, REDSTONE.....	4,740	23.0	45.0	21.0	10,940	3,835	14,775	5	698	694	5

¹ When experience factors are not available, use 400 gal of fuel per day for miscellaneous small fuel-consuming devices

² Includes medical detachment.

³ Average daily gasoline consumption (net) is 15 gal per kitchen.

⁴ Does not include data for Army aircraft

⁵ Data not available.

5.22. Gasoline and Oil Supply Data—Chemical Units

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of organic fuel cans			Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubrica- tion (lb)	Grease miscel- laneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Total vehicle tanks; vehicle cans 5-gal	Resupply kitchens, airplanes, and miscel- laneous	Motor vehicles	Total miscel- laneous and motor vehicles	
2	HQ & HQ det, eml gp.....	66	1.7	2.1	1.7	145	55	200	4	7	11	-----
3	HQ & HQ det, eml smoke genr bn.....	57	1.1	1.8	1.4	130	55	185	3	8	11	1
4	Cml smoke genr co ¹	522	13.0	19.0	13.0	1,155	2,750	3,905	482	67	549	1
5	HQ & HQ det, eml bn, sve.....	59	1.5	1.9	1.5	130	50	180	4	6	10	-----
6	Cml maint co.....	182	4.2	4.9	4.2	415	115	530	1	22	23	1
7	Cml dep co.....	291	5.8	10.8	6.4	560	155	715	5	26	31	1
8	Cml co, embt spt.....	864	20.4	30.8	20.4	1,970	570	2,540	3	114	117	1
9	Cml decon co.....	337	7.6	14.4	7.6	740	220	960	3	41	44	-----

¹ Basic load of 52.7 tons of fog oil and 3 tons of gasoline (class III supplies) as fuel for mechanical smoke generator operation (par. 5.37).

5.23. Gasoline and Oil Supply Data—U.S. Army Security Agency Units

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Unit	Fuel and lubricant requirements, motor vehicle consumption in moving unit 100 miles				Gasoline Capacity (gal)			Fuel can data, number of organic fuel cans			Number of generators ¹				Organic kitchens
		Vehicle fuel (gal)	Engine oil (gal)	Gear lubri- cation (lb)	Grease, miscel- laneous (lb)	Vehicle tanks	Vehicle cans, 5-gal	Total vehicle tanks; vehicle cans, 5-gal	Resupply, kitchens, airplanes, and miscel- laneous	Motor vehicles	Total miscel- laneous and motor vehicles	Gas (kw)			Diesel (kw)	
												0.35	1.50	5.00	15	
2	HQ, H&S co, USASA gp-----	828	18.8	33.4	19.8	2,212	1,305	3,517	201	60	261	² 2	2	² 6	8	1
3	HQ & HQ co, USASA bn-----	590	13.4	22.6	13.9	1,557	1,000	2,557	158	42	200	² 2	2	² 8	4	1
4	USASA op co (A)-----	912	20.4	38.2	22.1	2,471	1,235	3,706	188	59	247	² 2		² 4	11	1
5	USASA op co (B)-----	720	15.0	25.5	17.5	1,770	1,745	3,515	294	55	349	² 2	20	² 16	2	1
6	USASA op co (C)-----	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)
7	USASA proc co-----	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)	(³)
8	USASA sec co-----	588	12.8	23.1	13.9	1,533	1,440	2,973	247	41	288	² 2	9	² 30	1	1
9	USASA div spt co-----	528	11.8	17.4	13.8	1,287	1,650	2,937	280	50	330	² 2	9	² 48	1	1

¹ Fuel for operation of generators must be computed separately.

² Includes 50 percent spares.

³ Data not available.

5.24. Gasoline and Oil Supply Data—Selected Service Units^{1 2}

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Fuel and lubricant requirements, motor vehicle/ aircraft consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of organic fuel cans			Organic kitchens
1		Vehicle/ aircraft fuel (gal)	Engine oil (gal)	Gear lubricant (lb)	Grease, miscel- laneous (lb)	Vehicle/ aircraft tanks	Vehicle cans, 5-gal	Total ve- hicle/air- craft tanks; vehicle cans, 5-gal	Resupply, kitchens, airplanes, and miscel- laneous	Motor vehicles	Total miscel- laneous and motor vehicles	
2	Engr dump trk co.....	2,050/	31.9/	61.4/	41.6/	3,180/	695	3,875	16	123	139	1
3	Engr PNLBRG co.....	1,090/	23.4/	43.4/	23.6/	2,340/	1,875	4,215	37	338	375	1
4	Engr float brg co.....	2,525/	54.1/	63.6/	58.0/	4,840/	315	5,155	7	56	63	1
5	Engr topo bn, army.....	978/	11.6/	15.7/	12.5/	2,270/	805	3,075	44	117	161	3
6	HQ & HQ co.....	(342)/	(3.9)/	(5.5)/	(4.0)/	(708)/	(325)	(1,033)	(19)	(46)	(65)	(1)
7	Engr map repro and distr co army.....	(458)/	(5.7)/	(7.8)/	(6.5)/	(1,124)/	(340)	(1,464)	(16)	(52)	(68)	(1)
8	Engr photomapping co, army.....	(178)/	(2.0)/	(2.4)/	(2.0)/	(438)/	(140)	(578)	(9)	(19)	(28)	(1)
9	Engr topo co, corps.....	398/	5.2/	7.3/	6.0/	972/	345	1,317	23	45	68	1
10	Med amb co.....	455/	11.0/	12.2/	11.0/	1,080/	370	1,450	4	70	74	1
11	HQ & HQ det, QM gp.....	69/	0.1/	0.2/	0.1/	168/	75	243	7	8	15	1
12	Corps sig bn.....	3,511/	70.6/	128.5/	74.5/	8,500/	2,915	11,415	233	350	583	3
13	HQ & HQ co.....	(441)/	(9.2)/	(14.5)/	(9.4)/	(1,057)/	(345)	(1,402)	(25)	(44)	(69)	(1)
14	Comd op co.....	(1,346)/	(27.2)/	(48.0)/	(29.5)/	(3,222)/	(945)	(4,167)	(54)	(135)	(189)	(1)
15	Fld op co.....	(1,724)/	(34.2)/	(66.0)/	(35.6)/	(4,221)/	(1,625)	(5,846)	(154)	(171)	(325)	(1)
16	Trans amp trk co.....	915/	28.9/	43.0/	17.9/	2,100/	580	2,680	9	107	116	1
17	Trans lt trk co (2½-ton).....	1,150/	25.0/	50.0/	25.0/	3,690/	765	4,455	16	137	153	1
18	Trans lt trk co (5-ton).....	2,413.5/	51.8/	59.4/	51.8/	5,093/	1,285	6,378	16	257	273	1
19	Trans med trk co.....	2,160/	40.0/	55.0/	50.0/	6,930/	735	7,665	13	134	147	1
20	Trans hv trk co.....	2,570/	40.0/	25.0/	30.0/	3,000/	1,345	4,345	9	260	269	1
21	Trans ego carr co (tracked).....	1,620/	120.0/	45.0/	80.0/	3,240/	2,730	5,970	6	540	546	1
22	Trans carr co.....	700/	15.0/	15.0/	15.0/	1,450/	520	1,970	11	93	104	1
23	HQ & HQ det, trans tk bn.....	75/	1.0/	1.0/	1.0/	235/	130	365	13	13	26	1
24	HQ & HQ det, trans trk gp.....	120/	2.0/	2.0/	2.0/	290/	115	405	8	15	23	1
25	HQ & HQ co, trans hwy trans- port comd.....	110/	3.0/	3.0/	3.0/	300/	155	455	9	22	31	1
26	HQ & HQ det, trans transport acft bn.....	171/98	3.8/2.2	5.0/0.3	4.2/0.3	395/224	345	964	46	23	69	1
27	Trans lt hel co.....	328/1,750	6.4/20.8	10.1/6.2	6.6/4.2	781/5,226	445	6,452	40	49	89	1
28	Trans med hel co.....	376/4,370	7.2/85.6	12.0/9.8	7.3/6.6	908/6,582	440	7,930	36	52	88	1
29	HQ & HQ det, trans Army acft maint and sup gp.....	284/	5.6/	9.0/	6.2/	672/	280	952	22	34	56	1
30	HQ & HQ det, trans Army acft maint and sup bn.....	145/	3.0/	4.5/	3.3/	342/	175	517	17	18	35	-----

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Fuel and lubricant requirements, motor vehicle/ aircraft consumption in moving unit 100 miles				Gasoline capacity (gal)			Fuel can data, number of organic fuel cans			Organic kitchens
1		Vehicle/ aircraft fuel (gal)	Engine oil (gal)	Gear lubricant (lb)	Grease, miscel- laneous (lb)	Vehicle/ aircraft tanks	Vehicle cans, 5-gal	Total ve- hicle/air- craft tanks; vehicle cans, 5-gal	Resupply, kitchens, airplanes, and miscel- laneous	Motor vehicles	Total miscel- laneous and motor vehicles	
31	Trans Army acft maint and sup co, DS-----	757/88	15.6/2.3	14.7/	12.5/0.1	1,735/253	525	2,513	20	85	105	1
32	Trans Army acft maint and sup co, med cgo acft-----	819/	16.4/	16.7/	13.8/	1,925/	550	2,475	23	87	110	1
33	Trans Army acft maint and sup co, lt cgo acft-----	708/	14.4/	15.9/	11.7/	1,619/	510	2,129	23	79	102	1
34	Trans Army acft sup co, GS---	460/	9.2/	10.9/	8.0/	1,107/	345	1,452	18	51	69	1
35	Trans Army acft maint co, air- plane, GS-----	419/	8.6/	9.2/	7.0/	953/	350	1,303	23	47	70	1
36	Trans Army acft maint co, hel, GS-----	468/	9.6/	9.9/	7.8/	1,055/	380	1,435	23	53	76	1

¹ Average daily gasoline consumption (net) is 15 gal per kitchen.

² When a divider (/) is used in col. 2-6, figures left of the divider give vehicular data, while figures to the right pertain to aircraft.

Section V. CLASS V SUPPLY

5.25. Definitions and Responsibilities

a. Basic Load. A basic load of ammunition is a prescribed allowance of ammunition authorized and required to be in possession of a unit. It is expressed in terms of rounds for ammunition fired by weapons and in other units of measure for bulk allotment items. It includes ammunition carried by the individual soldier, the ammunition stowed in self-propelled weapons, and the ammunition carried in prime movers and in unit trains. This authorized amount of ammunition will normally sustain a unit in combat until resupply can be effected. It is established by the Department of the Army, based on recommendations of theater commanders. In wartime, it is normally requisitioned by and issued to all units located in an active theater, and such other units as may be specifically directed by the Department of the Army. In peacetime, it is normally requisitioned by and issued to those units specifically designated by the Department of the Army. The basic load of ammunition is not necessarily loaded on transport at all times but may be stowed at gun positions or stored in dumps. The composition of the basic load of ammunition, including fuzes, by type will, in general, be as established by SB 38-26. However, this proportion of type may be varied by field army commanders and unit commanders, based on assigned missions, and will be supplied so far as availability will permit. Bulk allotment items included in the basic load are listed in SB 38-26. The data for basic loads, as shown in the tables, provide the basis for instruction in all Department of the Army schools, to the exclusion of all other similar data. Under no circumstances will the average 50 percent overload of vehicles be used as a vehicle loading guide.

b. Prescribed Nuclear Load (PNL). The prescribed nuclear load is a specified quantity of nuclear weapons to be carried by a delivery unit. The establishment and replenishment of this load after expenditure is a command decision and is dependent on the tactical situation, the

nuclear logistical situation, and the capability of the unit of transporting and utilizing the load. It may vary from day to day and among similar delivery units.

c. Prescribed Stockage. The prescribed stockage is a specified quantity of nuclear rounds, components of nuclear rounds, and warhead test equipment to be stocked in special ammunition supply points or other logistical installations. The establishment and replenishment of this stockage are a command decision and are dependent on the tactical situation, the allocation, the capability of the logistical support unit to store and maintain the nuclear rounds, and the nuclear logistical situation. The prescribed stockage may vary from time to time and among similar logistical support units.

d. Required Supply Rate. The required supply rate is the amount of ammunition expressed in terms of rounds per weapon per day for ammunition items fired by weapons; and in terms of other units of measure per day for bulk allotment and other items, estimated to be required to sustain operations of any designated force without restriction for a specified period. Tactical commanders use this rate to state their requirement for ammunition to support planned tactical operations at specified intervals. Required supply rates are submitted through command channels and are consolidated at each echelon and considered by the commander in determining the available supply rate within his command. The required supply rate is computed on and applied to tactical weapons only.

e. Available Supply Rate. The available supply rate is the rate of consumption of ammunition that can be sustained with available supplies, announced by each commander and applicable within his command. For ammunition items fired from weapons, this rate is expressed in rounds per weapon per day. For bulk allotment items, such as antitank mines, hand grenades, and demolition explosives, the rate is expressed in terms of units of measure (each, pound) by organization, individual, or

vehicle per day. It is flexible to conform to changing operational plans and commitments and changing tactical conditions. It is used as a control within a unit on the amount of ammunition that may be expended by that unit. At army group and field army level, the term is also used as a forecast of ammunition availability. The available supply rate is computed on, and applied to, tactical weapons only; that is, the weapons in divisions, and the crew-served weapons in nondivisional tactical units. Weapons in combat support units and service support units are excluded unless unusual circumstances necessitate their employment in a combat role.

f. Ammunition Day of Supply. The ammunition day of supply is the estimated quantity of ammunition required per day to sustain operations in an active theater in wartime. It is expressed in terms of rounds per weapon per day for ammunition items fired by weapons, and in terms of other units of measure for bulk allotment and other ammunition items. It is used by the Department of the Army for overall supply planning and supply control purposes and by theater commanders in establishing theater stock levels. The basis is applied to weapons authorized to be in the hands of all troops in the theater, beginning with their arrival in the theater. The ammunition day of supply includes the proper proportions of types of rounds for each weapon and the correct proportions of types of fuzes and extra fuzes for the various types of rounds. The ammunition day of supply is contained in SB 38-26 and AR 11-8. It is for use, initially, in a newly established theater and is the basis for initial stockage of the theater, and for use until such time as experience provides a firm basis for correction. It is applicable to a balanced theater army command of not less than 150,000 men, and will require evaluation and may require adjustment should the army command be unbalanced or consist of a lesser number. It is used for detailed current planning and supply purposes in support of an active theater of operations. It is applicable to currently assigned troop strength and organization. It is established by the Department of the Army in

conjunction with appropriate theater commanders. If an established theater becomes active, the provisions of SB 38-26 and AR 11-8 will govern until experience indicates that a revision for that theater is required. It is the responsibility of theater commanders, for both new and established theaters, to make continuous studies of ammunition expenditures and recommend to the Department of the Army necessary changes to established ammunition days of supply so that planning data will be maintained current. Consideration will be given to the fact that increases in the ammunition day of supply will result in increases in production rates, will require additional manpower and raw materials, and may require additional manufacturing facilities. When an increase must be supported by new procurement, a minimum timelag of 12 months normally occurs between the theater recommendations to the Department of the Army and the arrival of the materials in the theater. Decreases in requirements for ammunition will be promptly reported to the Department of the Army so that production programs may be adjusted as promptly as possible, with the release of manpower, facilities, and raw materials to other channels.

g. Supply to Units Within Combat Zone. The efficient operation of the ammunition supply system in the combat zone depends on the maintenance of basic loads, by drawing ammunition from the depot or supply point designated to support the unit. Maintenance of the basic load is the responsibility of the unit commander. The supply installations supporting the unit will fill ammunition requisitions received bearing the statement "Required to Replenish Basic Load (or Required for Immediate Consumption): Expenditures Are Within Authorized Available Supply Rate." When an ammunition supply point is unable to fill ammunition requisitions, the supply point commander reports that fact promptly to the field army ammunition supply officer, requests instructions as to where the ammunition can be obtained, and instructs the unit ammunition representative accordingly.

h. Field Army Commander. The field army commander is responsible for—

(1) Evaluation of the required supply

rates submitted by the corps and other tactical organizations assigned or attached to the field army and submission of a consolidated required supply rate to the army group commander.

- (2) Determination of available supply rates to corps and other tactical organizations assigned or attached to the field army.
- (3) Submission of ammunition status reports.
- (4) Recommendation of basic load to suit his mission.
- (5) Maintenance of adequate tactical reserves in field army ammunition installations and distribution of ammunition within the field army area.
- (6) Calling forward ammunition from the communications zone to replenish withdrawals from field army ammunition installations.
- (7) Enforcement of supply economy.

i. Corps, Division, and Other Tactical Unit Commanders. Corps, divisions, and other tactical unit commanders are responsible for—

- (1) Evaluation of the required supply rates submitted by subordinate tactical commands and submission of a consolidated required supply rate to the next higher tactical commander.
- (2) Determination of the available supply

rates, based on availability to subordinate tactical commanders.

- (3) Maintenance of basic loads at prescribed level.
- (4) Enforcement of supply economy.

j. Procedures. See FM 9-5 and FM 100-10.

5.26. Ordnance Ammunition Day of Supply Data—Weapons

Information regarding estimated average quantity of ammunition required per day to sustain operations in an active combat theater is contained in SB 38-26. Proportion of types of rounds, fuzes, and extra fuzes is included where applicable.

5.27. Ordnance Ammunition Day of Supply Data

Information regarding estimated average quantity of demolitions, explosives, grenades, and pyrotechnics required per division per day to sustain operations in an active combat theater is contained in SB 38-26.

5.28. Chemical Ammunition Day of Supply Data

Information regarding estimated average quantity of chemical hand grenades, smoke pots, landmines, and incendiaries required per organization per day to sustain operations in an active combat theater is contained in SB 38-26.

5.29. Combat Vehicle Ammunition Data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Armament				Miscellaneous stowage ¹				Rounds per vehicle			Ammunition						
	Combat vehicle	Principal weapon	MG, cal .30/7.62-mm, GP, M60	MG, cal .50	Grenades per vehicle	Flares, signal, ground, per vehicle	Miscellaneous per vehicle	Principal weapon	MG, cal .30/7.62-mm, GP, M60	SMG, cal .45	MG, cal .50	Ammunition stowage (in rounds per vehicle)				Rounds per vehicle in trains		
1												Principal weapon	MG, cal .30/7.62-mm, GP, M60	MG, cal .50	Principal weapon	MG, cal .30/7.62-mm, GP, M60	Principal weapon	MG, cal .30/7.62-mm, GP, M60	SMG, cal .45	MG, cal .50
2	Carrier, pers, full-tracked, armd, M59.			1	20 hand	12					180	1,800			180	1,800		
3	Carrier, pers, full-tracked, armd, M113.			1	20 hand		Rkt, 3.5-in., 18 rd.				180	2,000			180	2,000		
4	Gun, twin 40-mm, SP, full-tracked.	40-mm gun (twin).			8 hand		Rkt, 3.5-in., 4 rd; carbine, 360 rd.	720				480				240		
5	Gun, 90-mm, SP, full-tracked.	90-mm gun.						29				29						
6	Howitzer, 105-mm, SP, full-tracked.	105-mm how.		1	8 smoke or frag.			250			1,100	56		180	1,100	194		
7	Howitzer, 155-mm, SP, full-tracked.	155-mm how.		1	8 hand			150		180	945	24		180	945	126		
8	Howitzer, 8-in., SP, full-tracked.	8-in. how.		1	8 hand			148		180	900	10		180	900	138		
9	Launcher, 762-mm rkt.	762-mm rkt.						5				1				4		
10	Mortar, 4.2-in., SP, full-tracked.	4.2-in. mort.		1	12 hand		12 mines	136		180	1,800	96		180	1,800	40		

11	Tk, cmbt, full-tracked, lt gun.	76-mm gun.	1	1	8 hand	12	-----	62	5,000	180	735	60	5,000	180	630	2	-----	105
12	Tk, cmbt, full-tracked, med gun, M48A2.	90-mm gun.	1	1	8 hand	12	-----	77	6,500	180	630	60	5,900	180	500	17	600	130
13	Tk, cmbt, full-tracked, med gun, M60.	105-mm gun.	1	1	8 hand	12	-----	74	6,500	-----	1,260	57	5,950	-----	840	17	550	420
14	Tk, cmbt, full-tracked, 120-mm gun.	120-mm gun.	2	1	12 hand	-----	-----	43	8,850	300	525	34	4,000	300	525	9	4,850	-----
15	Tk recovery vehicle, hv, M51.	-----	1	1	20 hand	-----	Rkt, 3.5-in., 10 rd; 6 pot smoke.	-----	540	180	1,815	-----	540	180	1,500	-----	-----	315
16	Tk recovery vehicle, med, M74.	-----	1	1	20 hand	16	Rkt, 3.5-in., 10 rd; 6 pot, smoke.	-----	2,000	180	1,680	-----	2,000	180	1,050	-----	-----	630

¹ Included in basic load.

5.30. Estimated Expenditures of Ammunition¹

a. Ammunition Per Weapon Per Day, Expressed in Rounds.²

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Weapon	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engage- ment	Pursuit	Retire- ment or delaying action	Assault of hostile shore	Pro- tracted period
		Permanent fortifications		Deliberately organized		Hastily organized		First day	Succeed- ing days						
		First day	Succeed- ing days	First day	Succeed- ing days										
2	Carbine, cal .30-----	6	3	6	3	5	4	8	6	1.0	4	1.0	3.0	5	2.0
3	Gun, mach, cal .30, Bng-----	170	100	160	90	120	100	200	120	40.0	100	20.0	70.0	120	50.0
4	Gun, submach, cal .45-----	35	20	35	20	25	20	40	25	8.0	20	4.0	15.0	25	10.0
5	Gun, mach, cal .50, Bng, hv bbl ³ -----	50	30	50	30	35	30	60	35	15.0	30	5.0	20.0	35	20.0
6	Howitzer, 105-mm, towed or SP-----	150	90	145	80	110	90	180	110	35.0	90	18.0	65.0	110	45.0
7	Howitzer, 155-mm, towed or SP-----	120	70	110	65	85	0	140	85	30.0	70	15.0	50.0	85	35.0
8	Howitzer, 8-in, towed or SP--	85	50	80	45	60	0	100	60	20.0	50	0.0	0.0	60	25.0
9	Launcher, rkt, 3.5-in.-----	5	3	5	3	3	2	6	4	1.0	2	1.0	2.0	4	1.5
10	Mortar, 81-mm-----	70	40	64	35	50	40	80	50	16.0	40	8.0	30.0	50	20.0
11	Mortar, 4.2-in.-----	70	40	64	35	50	40	80	50	16.0	40	8.0	30.0	50	20.0
12	Pistol, semiauto, cal .45-----	2	1	2	1	1	1	2	1	0.2	1	0.2	0.3	2	0.3
13	Rifle, U.S., cal .30-----	20	15	20	15	15	15	25	15	5.0	15	3.0	10.0	15	6.0
14	Rifle, auto, cal .30, Bng-----	70	40	65	35	50	40	80	50	15.0	40	8.0	30.0	50	20.0
15	Tk, cmbt, full-tracked, lt gun--	15	8	13	7	10	8	16	10	3.0	8	2.0	5.0	10	4.0
16	Tk, cmbt, full-tracked, med gun, M48A2-----	22	12	20	11	15	12	25	15	5.0	12	3.0	8.0	15	6.0

¹ For ammunition data pertaining to air defense artillery, see FM 101-10, part III, chapter 5, section II.

² Figures were derived from a study of World War II experience plus consideration of postwar development of materiel and reorganization of units. The quantities are representative of actual requirements when applicable to units of battle group size or larger.

³ Multiple mounts will require specified quantities for each barrel.

b. Ammunition Per Type Unit Per Day, Expressed in Tons.¹

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Weapon	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engage- ment	Pursuit	Retire- ment or delaying action	Assault of hostile shore	Airborne assault
		Permanent fortifications		Deliberately organized		Hastily organized		First day	Succeed- ing days						
		First day	Succeed- ing days	First day	Succeed- ing days										
2	Division slice.....	850	500	800	450	600	400	1,000	600	200	500	100	350	600	-----
3	Airborne division.....	466	271	437	249	329	197	545	321	116	267	60	192	333	286
4	Armored division.....	512	297	480	271	361	222	597	366	125	292	66	208	366	-----
5	Infantry division.....	544	317	511	289	386	243	638	390	146	313	69	226	390	-----
6	Corps artillery—155-mm howitzer (per bn).....	121	71	111	66	86	80	142	86	30	71	15	51	86	-----
7	Corps artillery—8-in. howit- zer (per bn).....	116	68	110	62	82	0	137	82	27	68	0	0	82	-----

¹ Figures were derived from World War II experience. These data may be used for planning purposes with modifications made for postwar reorganization of units.

5.31. Field Artillery Ammunition Expenditures¹

a. *Expressed in Rounds Per Weapon Per Hour.* (These figures are suitable for computing expenditures for periods of time less than 6 hours.)

1	Kind of fire or phase of action	2	3	4	5
		Average rate per piece per hour			
		105-mm how	155-mm how	8-in. how	762-mm rkt
2	Advance guard action, development, and deployment.....	25	12		
3	Preparation.....	80	25	25	3
	Supporting fires during the attack (including counter-battery):				
4	First 2 hours.....	50	25	25	3
5	After 2 hours.....	30	15	15	2
6	Exploitation, pursuit, delaying action, or delaying enemy development..	25	12	12	2
7	Counterpreparation.....	60	25	25	3
8	Defensive fires against infantry attack (including counterbattery).....	50	25	25	3
9	Fortified position.....	50	25	25	3

b. *Expressed in Tons Per Battalion Per Hour.* (These figures are suitable for computing expenditures for periods of time less than 6 hours.)

1	Kind of fire or phase of action	2	3	4	5
		Average tonnage per battalion per hour			
		105-mm how	155-mm how	8-in. how	762-mm rkt
2	Advance guard action, development, and deployment.....	11.02	12.35		
3	Preparation.....	35.28	25.87	20.55	9
	Supporting fires during the attack (including counterbattery):				
4	First 2 hours.....	22.05	25.87	20.55	9
5	After 2 hours.....	13.22	15.52	12.33	6
6	Exploitation, pursuit, delaying action, or delaying enemy development..	11.02	12.42	9.86	6
7	Counterpreparation.....	26.46	25.87	20.55	9
8	Defensive fires against infantry attack (including counterbattery).....	22.05	25.87	20.55	9

¹ With the exception of 762-mm rocket, the figures in these tables are derived from World War II experience. They will require modification to fit modern organizations and tactical concepts.

5.32. Ammunition Supply Data—Airborne Division (TOE 57D)—Basic Load¹

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Air-dropped in bulk		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	COMD AND CON BN HQ & HQ CO (TOE 57-6D)											
2	File destroyer, incd, M4		25.500		3				76.50			76.50
3	Grenade, hand, incd, AN-M14		2.000		88				176.00			176.00
4	Grenade, hand, irritant, CN-DM, M6A1		1.100		43				47.30			47.30
5	Grenade, hand, riot, CN, M25A1		0.470		43				20.21			20.21
6	Gun, mach, 7.62-mm, lt-weight, GP	2,640	0.089	3	7,920	440	117.48	2,200	587.40			704.88
7	Launcher, rkt, 3.5-in.	6	17.700	9	54			6	955.80			955.80
8	Pistol, semiauto, cal .45	21	0.057	36	756	21	43.09					43.09
9	Rifle, semiauto, 7.62-mm, lt bbl	160	0.072	242	38,720	80	1,393.92	80	1,393.92			2,787.84
10	Starter, fire, M2		0.031		10				0.31			0.31
	ADMIN CO (TOE 12-157D)											4,811.93= 2.41 tons
11	File destroyer, incd, M4		25.500		16						408.00	408.00
12	Grenade, hand, incd, AN-M14		2.000		34						68.00	68.00
13	Gun, mach, 7.62-mm, lt-weight, GP	2,640	0.089	4	10,560	440	156.64	2,200	783.20			939.84
14	Pistol, semiauto, cal .45	21	0.057	13	273	21	15.56					15.56
15	Rifle, semiauto, 7.62-mm, lt bbl	160	0.072	103	16,480	80	593.28	80	593.28			1,186.56
16	Starter, fire, M2		0.031		6						0.19	0.19
	AVN CO (TOE 1-57D)											2,618.15= 1.31 tons
17	Cartridge, photoflash, M112		1.900		200			200	380.00			380.00
18	Cartridge, photoflash, M113		9.830		90			90	884.70			884.70
19	Pistol, semiauto, cal .45	21	0.057	69	1,449	21	82.59					82.59
20	Rifle, semiauto, 7.62-mm, lt bbl	160	0.072	156	24,960	80	898.56	80	898.56			1,797.12

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Air-dropped in bulk		Total wt (lb)
1						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
21	Signal, acft.....		0.720		240			240	172.80			172.80
	CAV TRP (TOE 17-77D)											3,317.21= 1.66 tons
22	Cartridge, photoflash, M112.....		1.900		200			200	380.00			380.00
23	Cartridge, photoflash, M113.....		9.830		90			90	884.70			884.70
24	Grenade, hand, colored smoke, M18 (green, red, yellow, violet).....		1.800		48				86.40			86.40
25	Grenade, hand, frag.....		2.100		150			150	315.00			315.00
26	Grenade, hand, incd, AN-M14.....		2.000		68				136.00			136.00
27	Grenade, hand, smoke, HC, AN-M8.....		1.600		16				25.60			25.60
28	Grenade, hand, smoke, WP, M15.....		1.900		16				30.40			30.40
29	Gun, mach, 7.62-mm, lt-weight, GP.....	2,640	0.089	40	105,600	440	1,566.40	2,200	7,832.00			9,398.40
30	Launcher, rkt, 3.5-in.....	6	17.700	2	12			6	212.40			212.40
31	Pistol, semiauto, cal .45.....	21	0.057	11	231	21	13.17					13.17
32	Rifle, auto-semiauto, 7.62-mm, se- lective, hv bbl.....	520	0.072	20	10,400	120	172.80	400	576.00			748.80
33	Rifle, semiauto, 7.62-mm, lt bbl.....	160	0.072	162	25,920	80	933.12	80	933.12			1,866.24
34	Rifle, 106-mm, on mount.....	30	60.000	5	150			30	9,000.00			9,000.00
35	Signal, acft.....		0.720		240			240	172.80			172.80
36	Starter, fire, M2.....		0.031		10				0.31			0.31
	5 ABN BG (ea) (TOE 7-31D)											23,270.22= 11.64 tons
37	Dml eqp set, explo, initiating, nonelec.....		42.410	60				60	2,544.60			2,544.60
38	File destroyer, incd, M4.....		25.500		1						25.50	25.50
39	Flare, trip, M49.....		2.840		352			352	999.68			999.68
40	Grenade, hand, colored smoke, M18 (green, red, yellow, violet).....		1.800		384						691.20	691.20
41	Grenade, hand, frag.....		2.100		3,000	3,000	6,300.00					6,300.00
42	Grenade, hand, incd, AN-M14.....		2.000		458						916.00	916.00
43	Grenade, hand, smoke, HC, AN-M8.....		1.600		336						537.60	537.60
44	Grenade, hand, smoke, WP, M15.....		1.900		320						608.00	608.00

45	Gun, mach, 7.62-mm, lt-weight, GP	3,520	0.089	54	190,080	880	4,229.28	1,760	8,458.56	880	4,229.28	16,917.12
46	Gun, 90-mm, SP, full-tracked	89	64.500	6	534			29	11,223.00	60	23,220.00	34,443.00
47	Ignition cylinder, ptbl flamethrower, M1		0.281		200						56.20	56.20
48	Launcher, grenade	20	6.900	147	2,940			10	10,143.00	10	10,143.00	20,286.00
49	Launcher, rkt, 3.5-in.	16	17.700	73	1,168	2	2,584.20	8	10,336.80	6	7,752.60	20,673.60
50	Mine apers, M14		0.500		810			810	405.00			405.00
51	Mine, apers, frag, dir, M48		4.500		2,000			2,000	9,000.00			9,000.00
52	Mine, at, M15		49.000		150			50	2,450.00	100	4,900.00	7,350.00
53	Mortar, 81-mm, on mount	120	17.800	15	1,800			70	18,690.00	50	13,350.00	32,040.00
54	Mortar, 105-mm ²	180	32.000	8	1,440			70	17,920.00	110	28,160.00	46,080.00
55	Pistol, semiauto, cal .45	21	0.057	352	7,392	21	421.34					421.34
56	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl	740	0.072	120	88,800	120	1,036.80	320	2,764.80	300	2,592.00	6,393.60
57	Rifle, semiauto, 7.62-mm, lt bbl	200	0.072	1,111	222,200	100	7,999.20	100	7,999.20			15,998.40
58	Rifle, 106-mm, on mount	50	60.000	10	500			20	12,000.00	30	18,000.00	30,000.00
59	Rifle, spotting, cal .50	208	0.336	10	2,080			104	349.44	104	349.44	698.88
60	Signal, gnd		2.000		180			180	360.00			360.00
61	Smoke pot, HC, M5		33.000		36						1,188.00	1,188.00
62	Starter, fire, M2		0.031		112						3.50	3.50
63	Thickener, incd, oil, M4 (2-lb can)		2.000		200						400.00	400.00
DIV ARTY (TOE 6-200D)												
64	File destroyer, incd, M4		25.500		2						51.00	51.00
65	Grenade, hand, colored smoke, M18 (green, red, yellow, violet)		1.800		224						403.20	403.20
66	Grenade, hand, frag		2.100		750			750	1,575.00			1,575.00
67	Grenade, hand, incd, AN-M14		2.000		210						420.00	420.00
68	Grenade, hand, smoke, HC, AN-M8		1.600		56						89.60	89.60
69	Gun, mach, 7.62-mm, lt-weight, GP	2,640	0.089	37	97,680	220	724.46	880	2,897.84	1,540	5,071.22	8,693.52
70	Howitzer, 105-mm, on carriage	190	60.000	25	4,750			40	60,000.00	150	225,000.00	285,000.00
71	Launcher, grenade	10	6.900	30	300			10	2,070.00			2,070.00
72	Launcher, 762-mm rkt, XM33	4	6,060.000	4	16			2	48,480.00	2	48,480.00	96,960.00
73	Launcher, rkt, 3.5-in.	10	17.700	42	420			10	7,434.00			7,434.00
74	Pistol, semiauto, cal .45	21	0.057	19	399	21	22.74					22.74
75	Rifle, semiauto, 7.62-mm, lt bbl	160	0.072	805	128,800	60	3,477.60			100	5,796.00	9,273.60
76	Signal, acft		0.720		72			72	51.84			51.84
77	Smoke pot, HC, M5		33.000		42						1,386.00	1,386.00
255,337.22= 127.67 tons × 5 = 638.35 tons												

See footnotes at end of table

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Air-dropped in bulk		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
78	Starter, fire, M2-----		0.031		46						1.40	1.40
	ENGR BN (TOE 5-225D)											413,431.90= 206.72 tons
79	Dml eqp set, explo, initiating, elec— nonelec-----		466.900	8				8	3,735.20			3,735.20
80	Dml eqp set, explo, initiating, non- elec-----		191.110	24				24	4,586.64			4,586.64
81	Explosives (bulk)-----										2,000.00	2,000.00
82	Flare, trip, M49-----		2.840		64			64	181.76			181.76
83	Grenade, hand, colored smoke, M18 (green, red, yellow, violet)-----		1.800		96						172.80	172.80
84	Grenade, hand, frag-----		2.100		450	450	945.00					945.00
85	Grenade, hand, incd, AN-M14-----		2.000		276						552.00	552.00
86	Grenade, hand, smoke, HC, AN-M8-----		1.600		24						38.40	38.40
87	Gun, mach, 7.62-mm, lt-weight, GP-----	3,520	0.089	30	105,600	440	1,174.80	1,320	3,524.40	1,760	4,699.20	9,398.40
88	Kit, torpedo, bangalore-----		205.000		4			4	820.00			820.00
89	Launcher, rkt, 3.5-in.-----	12	17.700	12	144			12	2,548.80			2,548.80
90	Mine, apers, M14-----		0.500		1,800			1,800	900.00			900.00
91	Mine, apers, frag, dir, M48-----		4.500		1,000			1,000	4,500.00			4,500.00
92	Mine, at, M7A2-----		7.200		160					160	1,152.00	1,152.00
93	Mine, at, M15-----		49.000		500					500	24,500.00	24,500.00
94	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17					13.17
95	Rifle, auto-semiauto, 7.62-mm, se- lective, hv bbl-----	740	0.072	24	17,760	120	207.36	400	691.20	220	380.16	1,278.72
96	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.072	438	70,080	60	1,892.16	100	3,153.60			5,045.76
97	Smoke pot, ftg, SGF2, AN-M7-----		26.500		12						318.00	318.00
98	Smoke pot, HC, M5-----		33.000		20						660.00	660.00
99	Starter, fire, M2-----		0.031		24						0.74	0.74
	SIG BN (TOE 11-555D)											63,347.39= 31.67 tons
100	File destroyer, incd, M4-----		25.500		12						306.00	306.00

101	Grenade, hand, colored smoke, M18 (green, red, yellow, violet)-----	1.800	-----	64	-----	-----	-----	-----	115.20	115.20
102	Grenade, hand, frag-----	2.100	-----	300	200	420.00	100	210.00	-----	630.00
103	Grenade, hand, incd, AN-M14-----	2.000	-----	144	-----	-----	-----	-----	288.00	288.00
104	Grenade, hand, smoke, HC, AN-M8-----	1.600	-----	16	-----	-----	-----	-----	25.60	25.60
105	Gun, mach, cal .50, Bng, hv bbl, flex. 630	0.396	2	1,260	-----	-----	630	498.96	-----	498.96
106	Gun, mach, 7.62-mm, lt-weight, GP. 1,760	0.089	15	26,400	440	587.40	440	587.40	880	1,174.80
107	Launcher, rkt, 3.5-in.-----	17.700	10	60	-----	-----	6	1,062.00	-----	1,062.00
108	Pistol, semiauto, cal .45-----	0.057	6	126	21	7.18	-----	-----	-----	7.18
109	Rifle, semiauto, 7.62-mm, lt bbl-----	0.072	350	56,000	60	1,512.00	100	2,520.00	-----	4,032.00
110	Starter, fire, M2-----	0.031	-----	10	-----	-----	-----	-----	0.31	0.31
SPT GP HQ & HQ DET (TOE 29-52D)										9,314.85= 4.66 tons
111	File destroyer, incd, M4-----	25.500	-----	1	-----	-----	-----	25.50	-----	25.50
112	Grenade, hand, incd, AN-M14-----	2.000	-----	20	-----	-----	-----	40.00	-----	40.00
113	Pistol, semiauto, cal .45-----	0.057	4	84	21	4.79	-----	-----	-----	4.79
114	Rifle, semiauto, 7.62-mm, lt bbl-----	0.072	42	5,040	60	181.44	60	181.44	-----	362.88
115	Starter, fire, M2-----	0.031	-----	4	-----	-----	-----	0.12	-----	0.12
QM PRCHT SUP AND MAINT CO (TOE 10-337D)										433.29= 0.22 tons
116	Cutter, reefing line, 2 sec-----	0.526	-----	2,500	-----	-----	2,500	1,315.00	-----	1,315.00
117	Cutter, reefing line, 10 sec-----	0.526	-----	2,100	-----	-----	2,100	1,104.60	-----	1,104.60
118	File destroyer, incd, M4-----	25.500	-----	1	-----	-----	-----	25.50	-----	25.50
119	Grenade, hand, colored smoke, M18 (green, red, yellow, violet)-----	1.800	-----	32	-----	-----	-----	57.60	-----	57.60
120	Grenade, hand, incd, AN-M14-----	2.000	-----	36	-----	-----	-----	72.00	-----	72.00
121	Grenade, hand, smoke, HC, AN-M8-----	1.600	-----	8	-----	-----	-----	12.80	-----	12.80
122	Launcher, rkt, 3.5-in.-----	17.700	1	6	-----	-----	6	106.20	-----	106.20
123	Pistol, semiauto, cal .45-----	0.057	1	21	21	1.20	-----	-----	-----	1.20
124	Rifle, semiauto, 7.62-mm, lt bbl-----	0.072	212	25,440	60	915.84	60	915.84	-----	1,831.68
125	Starter, fire, M2-----	0.031	-----	8	-----	-----	-----	0.25	-----	0.25
										4,526.83= 2.26 tons

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Air-dropped in bulk		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	SUP AND TRANSPORT CO (TOE 29-53D)											
126	File destroyer, incd, M4.....		25.500		2				51.00			51.00
127	Flare, trip, M49.....		2.840		128			128	363.52			363.52
128	Grenade, hand, colored smoke, M18 (green, red, yellow, violet).....		1.800		32				57.60			57.60
129	Grenade, hand, frag.....		2.100		525			525	1,102.50			1,102.50
130	Grenade, hand, incd, AN-M14.....		2.000		114				228.00			228.00
131	Grenade, hand, smoke, HC, AN-M8.....		1.600		8				12.80			12.80
132	Launcher, rkt, 3.5-in.....	6	17.700	8	48			6	849.60			849.60
133	Pistol, semiauto, cal .45.....	21	0.057	3	63	21	3.59					3.59
134	Rifle, semiauto, 7.62-mm, lt bbl....	120	0.072	156	18,720	60	673.92	60	673.92			1,347.84
135	Starter, fire, M2.....		0.031		8				0.25			0.25
	MED CO (TOE 8-67D)											4,016.70= 2.01 tons
136	File destroyer, incd, M4.....		25.500		1				25.50			25.50
137	Grenade, hand, colored smoke, M18 (green, red, yellow, violet).....		25.500		1				25.50			25.50
138	Grenade, hand, incd, AN-M14.....		2.000		118				236.00			236.00
139	Grenade, hand, smoke, HC, AN-M8.....		1.600		8				12.80			12.80
140	Pistol, semiauto, cal .45.....	21	0.057	20	420	21	23.94					23.94
141	Rifle, semiauto, 7.62-mm, lt bbl....	120	0.072	217	26,040	60	937.44	60	937.44			1,874.88
142	Starter, fire, M2.....		0.031		10				0.31			0.31
	MAINT BN HQ & MAIN SPT CO (TOE 29-56D)											2,231.03= 1.12 tons
143	File destroyer, incd, M4.....		25.500		1				25.50			25.50
144	Grenade, hand, colored smoke, M18 (green, red, yellow, violet).....		1.800		32				57.60			57.60
145	Grenade, hand, incd, AN-M14.....		2.000		52				104.00			104.00
146	Grenade, hand, smoke, HC, AN-M8.....		1.600		8				12.80			12.80

147	Gun, mach, cal .50, Bng, hv bbl, flex	630	0.396	2	1,260			630	498.96			498.96
148	Launcher, rkt, 3.5-in.	6	17.700	6	36			6	637.20			637.20
149	Pistol, semiauto, cal .45	21	0.057	6	126	21	7.18					7.18
150	Rifle, semiauto, 7.62-mm, lt bbl	120	0.072	284	34,080	60	1,226.88	60	1,226.88			2,453.76
151	Starter, fire, M2		0.031		8				0.25			0.25
EMERG REP CO (TOE 29-57D)												3,792.25= 1.90 tons
152	Grenade, hand, colored smoke, M18 (green, red, yellow, violet)		1.800		32				57.60			57.60
153	Grenade, hand, incd, AN-M14		2.000		126				252.00			252.00
154	Grenade, hand, smoke, HC, AN-M8		1.600		8				12.80			12.80
155	Gun, mach, 7.62-mm, lt-weight, GP	1,760	0.089	39	68,640			1,760	6,108.96			6,108.96
156	Launcher, rkt, 3.5-in.	6	17.700	3	18			6	318.60			318.60
157	Pistol, semiauto, cal .45	21	0.057	4	84	21	4.79					4.79
158	Rifle, semiauto, 7.62-mm, lt bbl	120	0.072	143	17,160	60	617.76	60	617.76			1,235.52
159	Starter, fire, M2		0.031		14				0.43			0.43
7,990.70= 4.00 tons												909.93 tons
160	Total tons abn div											

¹ Does not include augmentations.

² Data provided is for 4.2-in. mortar, which is issued as a substitute.

4,545

5.33. Ammunition Supply Data—Armored Division (TOE 17D)—Basic Load

a. Ammunition Supply Data—Armored Division (TOE 17D).¹

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	HQ & HQ CO, ARMD DIV (TOE 17-2D)											
2	Flares, sig ¹ -----		Negl		16			16	Negl			
3	Grenades ¹ -----		2.100		56					56	117.60	117.60
4	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	2	1,050			315	245.70	210	163.80	409.50
5	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	735	0.390	2	1,470			630	491.40	105	81.90	573.30
6	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	2	4,410			2,205	1,719.90			1,719.90
7	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	3	9,240			1,540	323.40	1,540	323.40	646.80
8	Gun, mach, cal .30 ^{1 2} -----	5,000	0.086	2	10,000			5,000	860.00			860.00
9	Gun, submach, cal .45-----	180	0.057	4	720			180	41.04			41.04
10	Gun, tk, 76-mm-----	70	42.500	2	140			65	5,525.00	5	425.00	5,950.00
11	Launcher, rkt, 3.5-in-----	6	17.700	3	18			3	159.30	3	159.30	318.60
12	Pistol, semiauto, cal .45-----	21	0.057	33	693	21	39.50					39.50
13	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	150	45,000	100	1,050.00	100	1,050.00	100	1,050.00	3,150.00
	3 HQ & HQ CO, CC (ea) (TOE 17-22D)											13,826.24= 6.91 tons
14	Flares, sig ¹ -----		Negl		96			96	Negl			
15	Grenades ¹ -----		2.100		176			176	369.60			369.60
16	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	3	1,575			315	368.55	210	245.70	614.25
17	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	2	3,360			1,260	982.80	420	327.60	1,310.40
18	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	6	13,230					2,205	5,159.70	5,159.70
19	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	5	15,400			1,540	539.00	1,540	539.00	1,078.00
20	Gun, mach, cal .30 ^{1 2} -----	6,500	0.086	2	13,000			6,000	1,032.00	500	86.00	1,118.00
21	Gun, submach, cal .45-----	180	0.057	4	720			180	41.04			41.04
22	Gun, tk, 90-mm-----	81	65.000	2	162			64	8,320.00	17	2,210.00	10,530.00
23	Launcher, rkt, 3.5-in-----	6	17.700	4	24			3	212.40	3	212.40	424.80

24	Pistol, semiauto, cal .45-----	21	0.057	19	399	21	22.74				22.74
25	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	107	32,100.	100	749.00	100	749.00	100	749.00
AVN CO (TOE 1-17D)											
26	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	1	525			315	122.85	210	81.90
27	Gun, mach, 7.62-mm, lt-weight, GP-----	3,080	0.070	4	12,320			1,540	431.20	1,540	431.20
28	Launcher, rkt, 3.5-in-----	6	17.700	4	24			3	212.40	3	212.40
29	Pistol, semiauto, cal .45-----	21	0.057	74	1,554	21	88.58				88.58
30	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	199	59,700	100	1,393.00	100	1,393.00	100	1,393.00
TRANS ACFT MAINT DET (TOE 55-79D)											
31	Pistol, semiauto, cal .45-----	21	0.057	2	42	21	2.39				2.39
32	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	62	18,600	100	434.00	100	434.00	100	434.00
MP CO (TOE 19-29D)											
33	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	1	525			315	122.85	210	81.90
34	Gun, mach, 7.62-mm, lt-weight, GP-----	3,080	0.070	4	12,320			1,540	431.20	1,540	431.20
35	Launcher, rkt, 3.5-in-----	6	17.700	4	24			3	212.40	3	212.40
36	Pistol, semiauto, cal .45-----	21	0.057	64	1,344	21	766.08				766.08
37	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	89	26,700	100	623.00	100	623.00	100	623.00
38	Rifle, semiauto, 7.62-mm, lt bbl, W bipod-----	1,100	0.070	48	52,800	180	604.80	600	2,016.00	320	1,075.20
22,915.53= 11.45 tons × 3= 34.35 tons											
5,759.53= 2.88 tons											
1,304.39= 0.65 tons											
7,823.03= 3.91 tons											

22,915.53=
11.45 tons
× 3=
34.35 tons

5,759.53=
2.88 tons

2.39
1,302.00
1,304.39=
0.65 tons

7,823.03=
3.91 tons

See footnotes at end of table.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
					Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
4 INF BN (ea) ³ (TOE 7-25D)											
39 Dml eqp set, explo, initiating, non- elec, W explo		110.000	5				30	150.00	80	400.00	550.00
40 Flares, sig ¹		Negl		1,020					1,020		
41 Grenades ¹		2.100		1,636			1,636	3,435.60			3,435.60
42 Gun, mach, cal .50, Bng, hv bbl, flex	525	0.390	22	11,550			315	2,702.70	210	1,801.80	4,504.50
43 Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	4	8,820			2,205	3,439.80			3,439.80
44 Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	77	169,785			2,205	66,216.15			66,216.15
45 Gun, mach, cal .50, Bng, hv bbl, flex ¹	1,680	0.390	6	10,080			1,050	2,457.00	630	1,474.20	3,931.20
46 Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	88	271,040			1,540	9,486.40	1,540	9,486.40	18,972.80
47 Gun, mach, cal .30 ^{1 2}	2,000	0.086	6	12,000			2,000	1,032.00			1,032.00
48 Gun, submach, cal .45	180	0.057	12	2,160			180	123.12			123.12
49 Launcher, rkt, 3.5-in.	14	17.700	73	1,022			7	9,044.70	7	9,044.70	18,089.40
50 Mine, apers, M14		0.490	450	450					450	220.50	220.50
51 Mine, apers, M16		11.250	52	52					52	585.00	585.00
52 Mine, at, M15		49.000	680	680			480	23,520.00	200	9,800.00	33,320.00
53 Mortar, 81-mm, on mount	120	15.000	12	1,440			97	17,460.00	23	4,140.00	21,600.00
54 Mortar, 4.2-in., SP, full-tracked	136	35.00	4	544			96	13,440.00	40	5,600.00	19,040.00
55 Pistol, semiauto, cal .45	21	0.057	110	2,310	21	131.67					131.67
56 Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	844	253,200	100	5,908.00	150	8,862.00	50	2,954.00	17,724.00
57 Rifle, semiauto, 7.62-mm, lt bbl, W bipod	1,100	0.070	72	79,200	180	907.20	600	3,024.00	320	1,612.80	5,544.00
											218,459.74= 109.23 tons × 4= 436.92 tons
4 ARMOR BN, 90-MM (ea) (TOE 17-25D)											
58 Dml eqp set, explo, initiating, non- elec, W explo		110.000	1				30	30.00	80	80.00	110.00
59 Flares, sig ¹		Negl		1,320							
60 Grenades ¹		2.100		912			912	1,915.20			1,915.20

61	Gun, mach, cal .50, Bng, hv bbl, flex	525	0.390	23	12,075			315	2,825.55	210	1,883.70	4,709.25
62	Gun, mach, cal .50, Bng, hv bbl, bbl flex ¹	1,680	0.390	72	120,960			1,260	35,380.80	420	11,793.60	47,174.40
63	Gun, mach, cal .50, Bng, hv bbl, flex ¹	1,680	0.390	6	10,080			1,050	2,457.00	630	1,474.20	3,931.20
64	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	4	8,820			2,205	3,439.80			3,439.80
65	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	17	37,485			2,205	14,619.15			14,619.15
66	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	16	49,280			1,540	1,724.80	1,540	1,724.80	3,449.60
67	Gun, mach, cal .30 ^{1 2}	6,500	0.086	72	468,000			6,000	37,152.00	500	3,096.00	40,248.00
68	Gun, mach, cal .30 ^{1 2}	2,000	0.086	6	12,000			2,000	1,032.00			1,032.00
69	Gun, submach, cal .45	180	0.057	156	33,080			180	1,855.56			1,855.56
70	Gun, tk, 90-mm	81	65.000	72	5,832			64	299,520.00	17	79,560.00	379,080.00
71	Launcher, rkt, 3.5-in	9	17.700	40	360			6	4,248.00	3	2,124.00	6,372.00
72	Mine, apers, M14		0.490	450	450					450	220.50	220.50
73	Mine, apers, M16		11.250	52	52					52	585.00	585.00
74	Mine, at, M15 ¹		49.000		200					200	9,800.00	9,800.00
75	Mortar, 4.2-in, SP, full-tracked	136	35.00	4	544			96	13,440.00	40	5,600.00	19,040.00
76	Pistol, semiauto, cal .45	21	0.057	366	7,686	21	445.79					445.79
77	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	349	104,700	100	2,443.00	150	3,664.50	50	1,221.50	7,329.00
CAV SQ (TOE 17-45D)												
78	Dml eqp set, explo, initiating, non-elec, W explo		110.000	12				30	360.00	80	960.00	1,320.00
79	Flares, sig ¹		Negl		816							
80	Grenades ¹		2.100		1,008					1,008	2,116.80	2,116.80
81	Gun, mach, cal .50, Bng, hv bbl, flex	525	0.390	25	13,125			315	3,071.25	210	2,047.50	5,118.75
82	Gun, mach, cal .50 Bng, hv bbl, flex ¹	735	0.390	32	23,520			630	7,862.40	105	1,310.40	9,172.80
83	Gun, mach, cal .50, Bng, hv bbl, flex ¹	1,680	0.390	6	10,800			1,050	2,457.00	630	1,474.20	3,931.20
84	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	28	61,740			2,205	24,078.60			24,078.60
85	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	12	26,460			2,205	10,319.40			10,319.40
86	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	63	194,040			1,540	6,791.40	1,540	6,791.40	13,582.80
87	Gun, mach, cal .30 ^{1 2}	5,000	0.086	32	160,000			5,000	13,750.00			13,750.00
88	Gun, mach, cal .30 ^{1 2}	2,000	0.086	6	12,000			2,000	1,032.00			1,032.00
545,386.45= 272.70 tons × 4 = 1,090.80 tons												

545,386.45=
272.70 tons
× 4 =
1,090.80 tons

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
89	Gun, submach, cal .45	180	0.057	76	13,680			180	779.76			779.76
90	Gun, tk, 76-mm	70	42.500	32	2,240			65	88,400.00	5	6,800.00	95,200.00
91	Launcher, rkt, 3.5-in.	14	17.700	26	364			7	3,221.40	7	3,221.40	6,442.80
92	Mine, apers, M14		0.490	450	450					450	220.50	220.50
93	Mine, apers, M16		11.250	52	52					52	585.00	585.00
94	Mine, at, M15		49.000	346	346			96	4,704.00	250	12,250.00	16,954.00
95	Mortar, 4 2-in. SP, full-tracked	136	35.000	12	1,632			96	40,320.00	40	16,800.00	57,120.00
96	Pistol, semiauto, cal .45	21	0.057	210	4,410	21	251.37					251.37
97	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	585	175,500	100	4,095.00	150	6,142.50	50	2,047.50	12,285.00
98	Rifle, semiauto, 7.62-mm, lt bbl, W bipod	1,100	0.070	24	26,400	180	302.40	600	1,008.00	320	537.60	1,848.00
												276,108.78= 138.05 tons
	DIV ARTY HQ & HQ BTRY (TOE 6-301D)											
99	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	3	6,615			2,205	2,579.85			2,579.85
100	Gun, mach, 7.62-mm, lt-weight, GP	1,760	0.070	13	22,880			880	800.80	880	800.80	1,601.60
101	Launcher, rkt, 3.5-in.	10	17.700	7	70			5	619.50	5	619.50	1,239.00
102	Pistol, semiauto, cal .45	21	0.057	18	378	21	21.55					21.55
103	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	176	52,800	100	1,232.00	100	1,232.00	100	1,232.00	3,696.00
104	Rifle, semiauto, 7.62-mm, lt bbl, W bipod	1,100	0.070	3	3,300	180	37.80	600	126.00	320	67.20	231.00
												9,369.00= 4.69 tons
	3 FA HOW BN, 105-MM, SP (ea) (TOE 6-315D)											
105	Grenades ¹		2.100		340					340	714.00	714.00
106	Gun, mach, cal .50, Bng, hv bbl, flex ¹	945	0.390	18	17,010			945	6,633.90			6,633.90
107	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	9	19,845			2,205	7,739.55			7,739.55
108	Gun, mach, cal .50, Bng, hv bbl, flex ¹	1,680	0.390	2	3,360			1,050	819.00	630	491.40	1,310.40
109	Gun, mach, 7.62-mm, lt-weight, GP	1,760	0.070	29	51,040			880	1,786.40	880	1,786.40	3,752.80

110	Gun, mach, cal .30 ¹ 2	2,000	0.086	2	12,000			2,000	1,032.00			1,032.00
111	Howitzer, 105-mm, SP	275	60.000	18	4,950			102	110,160.00	173	186,840.00	297,000.00
112	Launcher, rkt, 3.5-in.	10	17.700	24	240			5	2,124.00	5	2,124.00	4,248.00
113	Pistol, semiauto, cal .45	21	0.057	25	525	21	29.93					29.93
114	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	505	151,500	100	3,535.00	150	5,302.50	50	1,767.50	10,605.00
115	Rifle, semiauto, 7.62-mm, lt bbl, W bipod	1,100	0.070	49	53,900	180	617.40	600	2,058.00	320	1,097.60	3,773.00
FA BM, 155-MM, 8-IN. HOW, 762-MM RKT, SP (TOE 6-325D)												
116	Grenades ¹		2.100		348					348	730.80	730.80
117	Gun, mach, cal .50, Bng, hv bbl, flex ¹	945	0.390	4	3,780			945	1,474.20			1,474.20
118	Gun, mach, cal .50, Bng, hv bbl, flex ¹	945	0.390	12	11,340			945	4,422.60			4,422.60
119	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	8	17,640			2,205	6,879.60			6,879.60
120	Gun, mach, cal .50, Bng, hv bbl, flex ¹	1,680	0.390	2	3,360			1,050	819.00	630	491.40	1,310.40
121	Gun, mach, 7.62-mm, lt-weight, GP	1,760	0.070	29	51,040			880	1,786.40	880	1,786.40	3,572.80
122	Gun, mach, cal .30 ¹ 2	2,000	0.086	2	4,000			2,000	344.00			344.00
123	Howitzer, 155-mm, SP	150	112.000	12	1,800			30	40,320.00	120	161,280.00	201,600.00
124	Howitzer, 8-in., SP	150	253.000	4	600			10	10,120.00	140	141,680.00	151,800.00
125	Launcher, 762-mm rkt	3	6,060.000	2	6			1	12,120.00	2	24,240.00	36,360.00
126	Launcher, rkt, 3.5-in.	10	17.700	32	320			5	2,832.00	5	2,832.00	5,664.00
127	Pistol, semiauto, cal .45	21	0.057	24	504	21	28.73					28.73
128	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	553	165,900	100	3,871.00	150	5,806.50	50	1,935.50	11,613.00
129	Rifle, semiauto, 7.62-mm, lt bbl, W bipod	1,100	0.070	35	38,500	180	441.00	600	1,470.00	320	784.00	2,695.00
ENGR BN (TOE 5-5D)												
130	Dml eqp set, explo, initiating, elec—nonelec, W explo		20.000	48			960.00					960.00
131	Explosives							7,200.00			8,840.00	16,040.00
132	Flares, sig ¹		Negl		788							
133	Grenades ¹		2.100		1,020						2,142.00	2,142.00

336,658.58=
 168.33 tons
 × 3=
 504.99 tons

428,495.13 =
 214.25 tons

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpa	Wt per rd (lb)	Total wpa	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpa	Total wt (lb)	Rd per wpa	Total wt (lb)	Rd per wpa	Total wt (lb)	
134	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	47	24,675	-----	-----	315	5,773.95	210	3,849.30	9,623.25
135	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	12	20,160	-----	-----	1,260	5,896.80	420	1,965.60	7,862.40
136	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	43	94,815	-----	-----	2,205	36,977.85	-----	-----	36,977.85
137	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	2	3,360	-----	-----	1,050	819.00	630	491.40	1,310.40
138	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	42	129,360	-----	-----	1,540	4,527.60	1,540	4,527.60	9,055.20
139	Gun, mach, cal .30 ¹ 2-----	6,500	0.086	12	78,000	-----	-----	6,000	6,192.00	500	516.00	6,708.00
140	Gun, mach, cal .30 ¹ 2-----	2,000	0.086	2	4,000	-----	-----	2,000	344.00	-----	-----	344.00
141	Gun, tk, 90-mm-----	81	65.000	12	972	-----	-----	64	49,920.00	17	13,260.00	63,180.00
142	Launcher, rkt, 3.5-in.-----	14	17.700	47	658	-----	-----	7	5,823.30	7	5,823.30	11,646.60
143	Mine, apers, M14-----	4,230	0.490	-----	-----	-----	-----	3,240	1,587.60	990	485.10	2,072.70
144	Mine, apers, M16-----	680	11.250	-----	-----	-----	-----	480	5,400.00	200	2,250.00	7,650.00
145	Mine, at, M15-----	2,200	49.000	-----	-----	-----	-----	1,600	78,400.00	600	29,400.00	107,800.00
146	Pistol, semiauto, cal .45-----	21	0.057	78	1,638	21	93.37	-----	-----	-----	-----	93.37
147	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	966	289,800	100	6,762.00	150	10,143.59	50	3,381.00	20,286.00
SIG BN (TOE 11-55D)												303,751.77 = 151.88 tons
148	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	12	6,300	-----	-----	315	1,474.20	210	982.80	2,457.00
149	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	3	6,615	-----	-----	2,205	2,579.85	-----	-----	2,579.85
150	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	3	9,240	-----	-----	1,540	323.40	1,540	323.40	646.80
151	Launcher, rkt, 3.5-in.-----	6	17.700	14	84	-----	-----	3	743.40	3	743.40	1,486.80
152	Pistol, semiauto, cal .45-----	21	0.057	12	525	21	143.64	-----	-----	-----	-----	143.64
153	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	505	151,500	100	3,535.00	100	3,535.00	100	3,535.00	10,605.00
DIV TN HQ & HQ DET AND BAND (TOE 17-62D)												17,919.09 = 8.96 tons
154	Pistol, semiauto, cal .45-----	21	0.057	4	84	21	4.79	-----	-----	-----	-----	4.79

155	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	67	20,100	100	469.00	100	469.00	100	469.00	1,407.00
	QM BN (TOE 10-45D)											1,411.79 = 0.70 tons
156	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	28	14,700			315	3,439.80	210	2,293.20	5,733.00
157	Launcher, rkt, 3.5-in-----	6	17.700	6	36			3	31.86	3	31.86	63.72
158	Pistol, semiauto, cal .45-----	21	0.057	7	147	21	8.38					8.38
159	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	425	127,500	100	2,975.00	100	2,975.00	100	2,975.00	8,925.00
160	Rifle, semiauto, 7.62-mm, lt bbl, W bipod-----	1,100	0.070	5	5,500	180	63.00	600	210.00	320	112.00	385.00
	ORD BN (TOE 9 -65D)											15,115.10 = 7.56 tons
161	Grenades ¹ -----		2.100		212					212	445.20	445.20
162	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	18	9,450			315	2,211.30	210	1,474.20	3,685.50
163	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	4	6,720			1,050	1,638.00	630	982.80	2,620.80
164	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	9	19,845			2,205	2,381.40			2,381.40
165	Gun, mach, cal .30 ^{1 2} -----	2,000	0.086	4	8,000			2,000	6,880.00			6,880.00
166	Launcher, rkt, 3.5-in-----	6	17.700	12	72			3	637.20	3	637.20	1,274.40
167	Pistol, semiauto, cal .45-----	21	0.057	15	315	21	17.96					17.96
168	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	609	182,700	100	4,263.00	100	4,263.00	100	4,263.00	12,789.00
	MED BN (TOE 8-75D)											30,094.26 = 15.05 tons
169	Pistol, semiauto, cal .45-----	21	0.057	25	525	21	29.93					29.93
170	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	335	100,500	100	2,345.00	100	2,345.00	100	2,345.00	7,035.00
												7,064.93 = 3.53 tons

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
1						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
	ADMIN CO (TOE 12-27D)											
171	Gun, mach, cal .50, Bng, hv bbl, flex.	525	0.390	1	525			315	122.85	210	81.90	204.75
172	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.070	6	18,480			1,540	646.80	1,540	646.80	1,293.60
173	Launcher, rkt, 3.5-in.	6	17.700	4	24			3	212.40	3	212.40	424.80
174	Pistol, semiauto, cal .45	21	0.057	18	378	21	21.55					21.55
175	Rifle, semiauto, 7.62-mm, lt bbl	300	0.070	159	47,700	100	1,113.00	100	1,113.00	100	1,113.00	3,339.00
176	Total tons armd div											5,283.70 = 2.64 tons 2,628.72 tons

¹ In addition to main armament, the following quantities of ammunition should be provided as indicated:

Combat vehicle	Number of rd MG, cal .50	Number of rd MG, cal .30	Number of grenades	Number of flares
Carrier, pers, full-tracked, armd	2,205	—	20	12
Howitzer, 105-mm, SP, full-tracked	945	—	8	—
Howitzer, 155-mm, SP, full-tracked	945	—	8	—
Howitzer, 8-in., SP, full-tracked	945	—	8	—
Launcher, M48 tk chassis, for armd veh launched brg	—	—	8	16
Mortar, 4.2-in., SP, full-tracked	2,205	—	12	—
Tk, cmbt, full-tracked, lt gun	735	5,000	8	12
Tk, cmbt, full-tracked, med gun, M48A2	1,680	6,500	8	12
Tk recovery vehicle, med	1,680	2,000	8	16

² Substitute 7.62-mm MG for cal .30 MG when appropriate.

³ Data pertaining to armd div inf bn are applicable when unit is organized as a separate bn.

b. *Weight of Armored Division (TOE 17D) Basic Load of Ammunition* (based on type combat vehicles).

	1	2	3	4	5	6
	Unit	TOE	Wt of basic load for TOE weapons, mines, and demolitions (tons)	Wt of basic load for on-vehicle armament (tons)	Total wt of unit basic load (tons)	Total wt for div (tons)
2	HQ & HQ co, armd div.....	17-2D	2.28	4.63	6.91	6.91
3	3 HQ & HQ co, CC.....	17-22D	2.21	9.24	11.45	34.35
4	Avn co.....	1-17D	2.88	0.00	2.88	2.88
5	Trans acft maint det.....	55-79D	0.65	0.00	0.65	0.65
6	MP co.....	19-29D	3.91	0.00	3.91	3.91
7	4 inf bn.....	7-25D	49.88	59.35	109.23	436.92
8	4 armor bn, 90-mm.....	17-25D	17.45	255.25	272.70	1,090.80
9	Cav sq.....	17-45D	29.69	108.36	138.05	138.05
10	HQ & HQ btry, div arty.....	6-301D	1.36	3.33	4.69	4.69
11	3 FA how bn, 105-mm, SP.....	6-315D	11.11	157.22	168.33	504.99
12	FA bn, 155-mm, 8-in. how, 762-mm rkt, SP.....	6-325D	11.79	202.46	214.25	214.25
13	Engr bn.....	5-5D	92.62	59.26	151.88	151.88
14	Sig bn.....	11-55D	7.67	1.29	8.96	8.96
15	HQ & HQ det and band, div tn.....	17-62D	0.70	0.00	0.70	0.70
16	QM bn.....	10-45D	7.56	0.00	7.56	7.56
17	Ord bn.....	9-65D	8.88	6.17	15.05	15.05
18	Med bn.....	8-75D	3.53	0.00	3.53	3.53
19	Admin co.....	12-27D	2.64	0.00	2.64	2.64
20	Total armd div.....					2,628.72

5.34. Ammunition Supply Data—Infantry Division (TOE 7D)—Basic Load^{1 2}

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
					Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
HQ & HQ CO, INF DIV (TOE 7-2D)											
2 Grenade, hand		2.100		200	200	420.00					420.00
3 Gun, mach, 7.62-mm, lt-weight, GP	2,000	0.088	8	16,000			1,000	704.00	1,000	704.00	1,408.00
4 Launcher, rkt, 3.5-in	4	17.700	11	44			4	778.80			778.80
5 Pistol, semiauto, cal .45	21	0.057	56	1,176	21	67.03					67.03
6 Rifle, semiauto, 7.62-mm, lt bbl	120	0.081	237	28,440	120	2,303.64					2,303.64
5 INF BG (ea) (TOE 7-11D)											4,977.47 = 2.49 tons
7 Dml eqp set, explo, initiating, elec— nonelec, W explo		20.000	8			160.00					160.00
8 Dml eqp set, explo, initiating, non- elec, W explo		110.000	9				30	270.00	80	720.00	990.00
9 Flare, trip, M49		3.200		304			208	665.60	96	307.20	972.80
10 Grenade, hand		2.100		3,000			56	117.60	2,944	6,182.40	6,300.00
11 Gun, mach, cal .50, Bng, hv bbl, flex, (carrier, pers, full-tracked) (OVM)	600	0.390	2	1,200			400	312.00	200	156.00	468.00
12 Gun, mach, cal .50, Bng, hv bbl, flex (gun, tk, 76-mm) (OVM)	735	0.390	2	1,470			630	491.40	105	81.90	573.30
13 Gun, mach, cal .50, Bng, hv bbl, flex (rifle, spotting, 106-mm) (OVM)	200	0.390	10	2,000			120	468.00	80	312.00	780.00
14 Gun, mach, 7.62-mm, lt-weight, GP	3,250	0.088	40	130,000			2,250	7,920.00	1,000	3,520.00	11,440.00
15 Gun, mach, cal .30 ³ (gun, tk, 76- mm) (OVM)	5,000	0.086	2	10,000			5,000	860.00			860.00
16 Gun, submach, cal .45	560	0.057	4	2,240	60	13.68	500	114.00			127.68
17 Gun, tk, 76-mm	70	42.500	2	140			65	5,525.00	5	425.00	5,950.00
18 Launcher, at/aslt msl, SS-10	5	103.000	5	25			3	1,545.00	2	1,030.00	2,575.00
19 Launcher, rkt, 3.5-in	18	17.700	54	972	7	6,690.60	5	4,779.00	6	5,734.80	17,204.00
20 Mine, apers, M16		11.200	200	200					200	2,240.00	2,240.00
21 Mine, at, M15		49.000	50	50					50	2,450.00	2,450.00
22 Mortar, 81-mm, on mount	120	15.000	16	1,920			48	11,520.00	72	17,280.00	28,800.00

	(HE 85%)-----	(102)										
	(Illuminating 5%)-----	(6)										
	(WP 10%)-----	(12)										
23	Mortar, 4.2-in., on mount-----	251	35.000	6	1,506			100	21,000.00	151	31,710.00	52,710.00
	(HE 80%)-----	(201)										
	(Illuminating 5%)-----	(12)										
	(WP.15%)-----	(38)										
24	Pistol, semiauto, cal .45-----	31	0.057	188	5,828	21	225.04			10	107.16	332.20
25	Rifle, 106-mm, on mount-----	40	60.000	10	400			16	9,600.00	24	14,400.00	24,000.00
	(HE 50%)-----	(20)										
	(HEP-T 50%)-----	(20)										
26	Rifle, auto-semiauto, 7.62-mm, se- lective, hv bbl-----	740	0.081	92	68,080	260	1,937.52	280	2,086.56	200	1,490.40	5,514.48
27	Rifle, semiauto, 7.62-mm, lt bbl-----	340	0.081	1,074	365,160	100	8,699.40	120	10,439.28	120	10,439.28	29,577.96
28	Shaped charge, M2A3-----		16.600	30	30					30	498.00	498.00
29	Weapon, apers, M18-----		6.830		300			198	1,352.34	102	696.66	2,049.00
												196,572.82= 98.29 tons × 5= 491.45 tons
DIV ARTY (TOE 6-100D)												
30	Grenade, hand-----		2.100		750			50	105.00	700	1,470.00	1,575.00
31	Gun, mach, cal .50, Bng, hv bbl, flex (OVM)-----	530	0.390	75	39,750			530	15,502.50			15,502.50
32	Gun, mach, 7.62-mm, lt-weight, GP-----	1,400	0.088	220	308,000	200	3,872.00	400	7,744.00	800	15,488.00	27,104.00
33	Howitzer, 105-mm, towed/SP-----	200	60.000	30	6,000			60	108,000.00	140	252,000.00	360,000.00
34	Howitzer, 155-mm, on carriage-----	150	112.000	30	4,500			24	80,640.00	126	423,360.00	504,000.00
35	Howitzer, 8-in., on carriage-----	100	253.000	4	400			20	20,240.00	80	80,960.00	101,200.00
36	Launcher, 762-mm rkt-----	5	6,060.000	2	10			1	12,120.00	4	48,480.00	60,600.00
37	Launcher, rkt, 3.5-in.-----	6	17.700	121	726			6	12,850.00			12,850.00
38	Pistol, semiauto, cal .45-----	21	0.057	106	2,226	21	126.88					126.88
39	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.081	2,063	330,080	100	16,710.30	60	10,026.18			26,736.48
												1,109,695.06 = 554.85 tons
ARMOR BN, 90-MM (TOE 17-65D)												
40	Dml eqp set, explo, initiating, non- elec, W explo-----		110.000	1				30	30.00	80	80.00	110.00
41	Flares, sig, gnd-----		2.000		1,396			1,396	2,792.00			2,792.00

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
42	Grenade, hand		2.100		1,128					1,128	2,368.80	2,368.80
43	Gun, mach, cal .50, Bng, hv bbl, flex	525	0.390	22	11,550			315	2,702.70	210	1,801.80	4,504.50
44	Gun, mach, cal .50, Bng, hv bbl, flex (carrier, pers, full-tracked) (OVM)	2,205	0.390	18	39,690			2,205	15,479.10			15,479.10
45	Gun, mach, cal .50, Bng, hv bbl, flex (gun, tk, 90-mm) (OVM)	1,680	0.390	89	149,520			1,260	43,734.60	420	14,578.20	58,312.80
46	Gun, mach, cal .50, Bng, hv bbl, flex (tk recovery vehicle, med) (OVM)	1,680	0.390	7	11,760			1,050	2,866.50	630	1,719.90	4,586.40
47	Gun, mach, 7.62-mm, lt-weight, GP	3,080	0.088	13	40,040			1,540	1,761.76	1,540	1,761.76	3,523.52
48	Gun, mach, cal .30 ³ (gun, tk, 90- mm) (OVM)	6,500	0.086	89	578,500			5,750	44,010.50	750	5,740.50	49,751.00
49	Gun, mach, cal .30 ³ (tk recovery vehicle, med) (OVM)	2,000	0.086	7	1,400			2,000	120.40			120.40
50	Gun, submach, cal .45	180	0.057	192	34,560			180	1,969.92			1,969.92
51	Gun, tk, 90-mm	81	64.000	89	7,209			64	364,544.00	17	96,832.00	461,376.00
52	Launcher, rkt, 3.5-in	9	17.700	37	333			6	3,929.40	3	1,964.70	5,894.10
53	Mine, apers, M14		0.490	450	450					450	220.50	220.50
54	Mine, apers, M16		11.200	52	52					52	582.40	582.40
55	Mine, at, M15		49.000	200	200					200	9,800.00	9,800.00
56	Pistol, semiauto, cal .45	21	0.057	438	9,198	21	524.28					524.28
57	Rifle, semiauto, 7.62-mm, lt bbl	300	0.081	321	96,300	100	2,600.10	150	3,900.15	50	1,300.05	7,800.30
	CAV SQ (TOE 17-85D)											629,716.02 = 314.86 tons
58	Dml eqp set, explo, initiating, non- elec, W explo		110.000	9				30	270.00	80	720.00	990.00
59	Flares, sig, gnd		2.000		386					386	772.00	772.00
60	Grenade, hand		2.100		784			784	1,646.40			1,646.40
61	Gun, mach, cal .50, Bng, hv bbl, flex	525	0.390	21	11,025			315	2,579.85	210	1,719.90	4,299.75
62	Gun, mach, cal .50, Bng, hv bbl, flex (carrier, pers, full-tracked) (OVM)	2,205	0.390	23	50,715			2,205	19,778.85			19,778.85

63	Gun, mach, cal .50, Bng, hv bbl, flex (gun, tk, 76-mm) (OVM)-----	735	0.390	23	16,905			630	5,651.10	105	941.85	6,592.95
64	Gun, mach, cal .50, Bng, hv bbl, flex (mortar, 4.2-in. SP) (OVM)---	2,205	0.390	9	19,845			2,205	7,739.55			7,739.55
65	Gun, mach, cal .50, Bng, hv bbl, flex (tk recovery vehicle, med) (OVM).	1,680	0.390	4	6,720			1,050	1,638.00	630	982.80	2,620.80
66	Gun, mach, 7.62-mm, lt-weight, GP.	3,080	0.088	47	144,760			1,540	6,369.44	1,540	6,369.44	12,738.88
67	Gun, mach, cal .30 ³ (gun, tk, 76-mm) (OVM)-----	5,000	0.086	23	115,000			5,000	9,890.00			9,890.00
68	Gun, mach, cal .30 ³ (tk recovery vehicle, med) (OVM)-----	2,000	0.086	4	8,000			2,000	688.00			688.00
69	Gun, submach, cal .45-----	180	0.057	54	9,720			180	544.04			544.04
70	Gun, tk, 76-mm-----	70	42.500	23	1,610			65	63,537.50	5	4,887.50	68,425.00
71	Launcher, rkt, 3.5-in-----	14	17.700	21	294			12	4,460.40	2	743.40	5,203.80
72	Mine, apers, M14-----		0.490	450	450					450	220.50	220.50
73	Mine, apers, M16-----		11.200	52	52					52	582.40	582.40
74	Mine, at, M15-----		49.000	346	346			96	4,704.00	250	12,250.00	16,954.00
75	Mortar, 4.2-in., SP, full-tracked---	136	35.000	9	1,224			96	30,240.00	40	12,600.00	42,840.00
76	Pistol, semiauto, cal .45-----	21	0.057	155	3,255	21	185.54					185.54
77	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.081	436	130,800	100	3,531.60	150	5,297.40	50	1,765.80	10,594.80
78	Rifle, semiauto, 7.62-mm, lt bbl, W bipod-----	1,100	0.081	18	19,800	180	262.44	600	874.80	320	466.56	1,603.80
AVN CO (TOE 1-7D)												214,911.06 = 107.46 tons
79	Grenade, hand-----		2.100		100			100	210.00			210.00
80	Gun, mach, cal .50, Bng, hv bbl, flex.	525	0.390	1	525			525	204.75			204.75
81	Gun, mach, 7.62-mm, lt-weight, GP.	2,000	0.088	4	8,000			1,000	352.00	1,000	352.00	704.00
82	Launcher, rkt., 3.5-in-----	4	17.700	4	16			4	283.20			283.20
83	Pistol, semiauto, cal .45-----	21	0.057	73	1,533	21	87.38					87.38
84	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.081	188	30,080	80	1,218.24	80	1,218.24			2,436.48
TRANS ACFT MAINT DET (TOE 55-79D)												3,925.81 = 1.96 tons
85	Pistol, semiauto, cal .45-----	21	0.057	2	42	21	2.39					2.39
86	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.081	57	17,100	100	461.70	100	461.70	100	461.70	1,385.10
												1,387.49 = 0.69 tons

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
	ENGR BN (TOE 5-15D)											
87	Dml epq set, explo, initiating, elec— nonelec, W explo		20.000	48			960.00					960.00
88	Explosives (bulk)											12,000.00
89	Grenade, hand		2.100		1,125			675	1,417.50	450	945.00	2,362.50
90	Gun, mach, cal .50, Bng, hv bbl, flex	730	0.390	25	18,250			400	3,900.00	330	3,217.50	7,117.50
91	Gun, mach, cal .50, Bng, hv bbl, flex (gun, tk, 90-mm) (OVM)	1,680	0.390	3	5,040			1,260	1,474.20	420	491.40	1,965.60
92	Gun, mach, 7.62-mm, lt-weight, GP	3,250	0.088	32	104,000			2,250	6,336.00	1,000	2,816.00	9,152.00
93	Gun, mach, cal .30 ^s (gun, tk, 90- mm) (OVM)	6,500	0.086	3	19,500			5,750	1,483.50	750	193.50	1,677.00
94	Gun, tk, 90-mm	70	64.000	3	210			57	10,944.00	13	2,496.00	13,440.00
95	Launcher, rkt, 3.5-in	12	17.700	39	468			6	4,141.80	6	4,141.80	8,283.60
96	Mine, apers, M14		0.490		1,800					1,800	882.00	882.00
97	Mine, at, M7A2		7.200		160					160	1,152.00	1,152.00
98	Mine, at, M15		49.000	500	500					500	24,500.00	24,500.00
99	Pistol, semiauto, cal .45	21	0.057	27	567	21	32.32					32.32
100	Rifle, semiauto, 7.62-mm, lt bbl	340	0.081	757	257,380	100	6,131.70	120	7,358.04	120	7,358.04	20,847.78
												104,372.30 = 52.19 tons
	SIG BN (TOE 11-5D)											
101	Grenade, hand		2.100		400	300	630.00			100	210.00	840.00
102	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	12	6,360			530	2,480.40			2,480.40
103	Gun, mach, 7.62-mm, lt-weight, GP	2,000	0.088	5	10,000			1,000	440.00	1,000	440.00	880.00
104	Launcher, rkt, 3.5-in	4	17.700	19	76			4	1,345.20			1,345.20
105	Pistol, semiauto, cal .45	21	0.057	12	252	21	14.36					14.36
106	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	519	51,900	100	4,203.90					4,203.90
												9,763.86 = 4.88 tons

DIV TN HQ & HQ DET AND BAND (TOE 7-62D)											
107	Grenade, hand		2.100		100			100	210.00		210.00
108	Gun, mach, 7.62-mm, lt-weight, GP.	2,000	0.088	1	2,000			1,000	88.00	1,000	88.00
109	Launcher, rkt, 3.5-in.	10	17.700	1	10			10	177.00		177.00
110	Pistol, semiauto, cal .45	21	0.057	6	126	21	7.18				7.18
111	Rifle, semiauto, 7.62-mm, lt bbl	160	0.081	61	9,760	80	395.28	80	395.28		790.56
											1,360.74 = 0.68 tons
ADMIN CO (TOE 12-7D)											
112	Grenade, hand		2.100		50					50	105.00
113	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	1	530			530	206.70		206.70
114	Gun, mach, 7.62-mm, lt-weight, GP.	2,000	0.088	4	8,000			1,000	352.00	1,000	352.00
115	Launcher, rkt, 3.5-in.	4	17.700	3	12			4	212.40		212.40
116	Pistol, semiauto, cal .45	21	0.057	16	336	21	19.52				19.52
117	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	152	15,200	60	738.72	40	492.48		1,231.20
											2,478.82 = 1.24 tons
QM CO (TOE 10-17D)											
118	Grenade, hand		2.100		50			50	105.00		105.00
119	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	4	2,120			530	826.80		826.80
120	Launcher, rkt, 3.5-in.	4	17.700	2	8			4	141.60		141.60
121	Pistol, semiauto, cal .45	21	0.057	3	63	21	3.59				3.59
122	Rifle, semiauto, 7.62-mm, lt bbl	160	0.081	164	26,240	80	1,062.72	80	1,062.72		2,125.44
											3,202.43 = 1.60 tons
ORD BN (TOE 9-25D)											
123	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	14	7,420			530	2,893.80		2,893.80
124	Gun, mach, cal .50, Bng, hv bbl, flex (OMV)	2,205	0.390	9	19,845			2,205	7,739.55		7,739.55
125	Gun, mach, 7.62-mm, lt-weight, GP.	2,000	0.088	11	22,000	250	242.000	750	726.00	1,000	968.00
126	Launcher, rkt, 3.5-in.	4	17.700	6	24			4	424.80		424.80

See footnotes at end of table.

I	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
127	Pistol, semiauto, cal .45-----	21	0.057	8	168	21	9.58	-----	-----	-----	-----	9.58
128	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.081	330	52,800	80	2,138.40	80	2,138.40	-----	-----	4,276.80
MED BN (TOE 8-15D)												17,280.53 = 8.64 tons
129	Pistol, semiauto, cal .45-----	21	0.057	21	441	21	25.14	-----	-----	-----	-----	25.14
130	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.081	280	44,800	80	1,814.40	80	1,814.40	-----	-----	3,628.80
TRANS BN (TOE 55-75D)												3,653.94 = 1.83 tons
131	Grenade, hand-----	-----	2.100	-----	2,300	-----	-----	2,300	4,830.00	-----	-----	4,830.00
132	Gun, mach, cal .50, Bng, hv bbl, flex (carriers, pers, full-tracked) (OVM)-----	2,205	0.390	115	253,575	-----	-----	2,205	98,894.25	-----	-----	98,894.25
133	Gun, mach, cal .50, Bng, hv bbl, flex (tk recovery vehicle, med) (OVM)-----	1,680	0.390	2	3,260	-----	-----	1,050	819.00	630	491.40	1,310.40
134	Gun, mach, 7.62-mm, lt-weight, GP-----	2,000	0.088	16	32,000	250	352.00	750	1,056.00	1,000	1,408.00	2,816.00
135	Launcher, rkt, 3.5-in-----	4	17.700	8	32	-----	-----	4	566.40	-----	-----	566.40
136	Pistol, semiauto, cal .45-----	21	0.057	9	189	21	10.78	-----	-----	-----	-----	10.78
137	Rifle, semiauto, 7.62-mm, lt bbl-----	160	0.081	453	72,480	80	2,935.44	80	2,935.44	-----	-----	5,870.88
138	Total tons inf div-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	114,298.71 = 57.15 tons 1,601.97 tons

¹ Data contained in this table are recommended for *planning purposes only* and are subject to continuous revision.

² Basic load data are based on the M48A2 tank and M59 APC.

³ Substitute 7.62-mm MG for cal .30 MG when appropriate.

5.35. Ammunition Supply Data—Armored Units (Nondivisional)—Basic Load

a. Ammunition Supply Data—Armored Units (Nondivisional).

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
1	HQ & HQ CO, ARMOR GP (TOE 17-32D)											
2	Gun, mach, cal .50, Bng, hv bbl, flex.....	525	0.390	5	2,625			315	614.25	210	409.50	1,023.75
3	Launcher, rkt, 3.5-in.....	6	17.700	4	24			3	212.40	3	212.40	424.80
4	Pistol, semiauto, cal .45.....	21	0.057	7	147	21	8.38					8.38
5	Rifle, semiauto, 7.62-mm, lt bbl.....	300	0.070	56	16,800	100	392.00	100	392.00	100	392.00	1,176.00
												2,632.93 = 1.31 tons
	ARMOR BN, 90-MM (NONDIV) (TOE 17-25D)											
	(Data in paragraph 5.33 pertaining to armored division armor battalion, 90-mm, are applicable when unit is organized as a separate battalion.)											
	HQ & HQ TRP, ARMED CAV REGT (TOE 17-52D)											
6	Gun, mach, cal .50, Bng, hv bbl, flex.....	525	0.390	2	1,050			315	245.70	210	163.80	409.50
7	Gun, mach, cal .50, Bng, hv bbl, flex ¹	735	0.390	2	1,470			630	491.40	105	81.90	573.30
8	Gun, mach, cal .50, Bng, hv bbl, flex ¹	2,205	0.390	4	8,820			2,205	3,439.80			3,439.80
9	Gun, mach, 7.62-mm, lt-weight, GP.....	3,080	0.070	4	12,320			1,540	431.20	1,540	431.20	862.40
10	Gun, mach, cal .30 ^{1 2}	5,000	0.086	2	10,000			5,000	860.00			860.00
11	Gun, submach, cal .45.....	180	0.057	4	720			180	41.04			41.04
12	Gun, tk, 76-mm.....	70	42.500	2	147			65	5,525.00	5	425.00	5,950.00
13	Launcher, rkt, 3.5-in.....	6	17.700	9	54			3	477.90	3	477.90	955.80

See footnotes at end of table

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
1						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
14	Pistol, semiauto, cal .45-----	21	0.057	22	462	21	26.33					26.33
15	Rifle, semiauto, 7.62-mm, lt bbl-----	300	0.070	89	26,700	100	623.00	100	623.00	100	623.00	1,869.00
	ARMD CAV SQ, ARMD CAV REGT (TOE 17-55D)											14,987.17 = 7.49 tons
16	Dml eqp set, explo, initiating, non- elec, W explo-----		110.000	9	990			30	270.00	80	720.00	990.00
17	Flares, sig ¹ -----		Negl									
18	Grenades ¹ -----		2.100		1,064					1,064	2,234.40	2,234.40
19	Gun, mach, cal .50, Bng, hv bbl, flex-----	525	0.390	25	13,125			315	3,071.25	210	2,047.50	5,118.75
20	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	27	59,535			2,205	23,218.65			23,218.65
21	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	945	0.390	6	5,670			945	2,211.30			2,211.30
22	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	2,205	0.390	9	19,845			2,205	7,739.55			7,739.55
23	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	735	0.390	23	16,905			630	5,651.10	105	941.85	6,592.95
24	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	17	28,560			1,260	8,353.80	420	2,784.60	11,138.40
25	Gun, mach, cal .50, Bng, hv bbl, flex ¹ -----	1,680	0.390	6	10,080			1,050	2,457.00	630	1,474.20	3,931.20
26	Gun, mach, 7.62-mm, lt-weight, GP-----	3,080	0.070	58	178,640			1,540	6,252.40	1,540	6,252.40	12,504.80
27	Gun, mach, cal .30 ^{1 2} -----	5,000	0.086	23	115,000			5,000	9,890.00			9,890.00
28	Gun, mach, cal .30 ^{1 2} -----	6,500	0.086	17	110,500			5,750	8,406.50	750	1,096.50	9,503.00
29	Gun, mach, cal .30 ^{1 2} -----	2,000	0.086	6	12,000			2,000	1,032.00			1,032.00
30	Gun, submach, cal .45-----	180	0.057	92	16,560			180	943.92			943.92
31	Gun, tk, 76-mm-----	70	42.500	23	1,610			65	63,537.50	5	4,887.50	68,425.00
32	Gun, tk, 90-mm-----	81	65.000	17	1,377			64	70,720.00	17	18,785.00	89,505.00
33	Howitzer, 105-mm, SP-----	275	60.000	6	1,650			102	36,720.00	173	62,280.00	99,000.00
34	Launcher, rkt, 3.5-in-----	14	17.700	37	518			7	4,584.30	7	4,584.30	9,168.60
35	Mine, apers, M14-----		0.490	450	450					450	220.50	220.50
36	Mine, apers, M16-----		11.250	52	52					52	585.00	585.00
37	Mine, at, M15-----		49.000	346	346			96	4,704.00	250	12,250.00	16,954.00
38	Mortar, 4.2-in., SP, full-tracked-----	136	35.000	9	1,224			96	30,240.00	40	12,600.00	42,840.00

39	Pistol, semiauto, cal .45.....	21	0.057	241	5,061	21	288.48	-----	-----	-----	-----	288.48
40	Rifle, semiauto, 7.62-mm, lt bbl....	300	0.070	580	174,000	100	4,060.00	150	6,090.00	50	2,030.00	12,180.00
41	Rifle, semiauto, 7.62-mm, lt bbl, W bipod.....	1,100	0.070	18	19,800	180	226.80	600	756.00	320	403.20	1,386.00
AVN CO, ARMD CAV REGT (TOE 1-67D)												437,601.50 = 218.80 tons
42	Gun, mach, 7.62-mm, lt-weight, GP....	3,080	0.070	6	18,480	-----	-----	1,540	646.80	1,540	646.80	1,293.60
43	Launcher, rkt, 3.5-in.....	6	17.700	4	24	-----	-----	3	212.40	3	212.40	424.80
44	Pistol, semiauto, cal .45.....	21	0.057	42	882	21	50.27	-----	-----	-----	-----	50.27
45	Rifle, semiauto, 7.62-mm, lt bbl....	300	0.070	126	37,800	100	882.00	100	882.00	100	882.00	2,646.00
												4,414.67 = 2.21 tons

¹ In addition to main armament, the following quantities of ammunition should be provided as indicated:

<i>Combat vehicle</i>	<i>Number of rd MG, cal .50</i>	<i>Number of rd MG, cal .30</i>	<i>Number of grenades</i>	<i>Number of flares</i>
Carrier, pers, full-tracked, armd.....	2,205	-----	20	12
Howitzer, 105-mm, SP, full-tracked.....	945	-----	8	—
Mortar, 4.2-in., SP, full-tracked.....	2,205	-----	12	—
Tk, cmbt, full-tracked, lt gun.....	735	5,000	8	12
Tk, cmbt, full-tracked, med gun, M48A2.....	1,680	6,500	8	12
Tk recovery vehicle, med.....	1,680	2,000	8	16

² Substitute 7.62-mm MG for cal .30 MG when appropriate.

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5.35

b. Weight of Basic Load of Ammunition for Armored Units (Nondivisional) (based on type combat vehicles).

	1	2	3	4	5
1	Unit	TOE	Wt of basic load for TOE weapons, mines, and demolitions (tons)	Wt of basic load for on-vehicle armament (tons)	Total wt of unit basic load (tons)
2	HQ & HQ co, armor gp.....	17-32D	1.31	0.00	1.31
3	Armor bn, 90-mm (nondiv).....	17-25D	17.45	55.25	272.70
4	Armd cav regt.....	17-51D	94.80	571.30	666.10
5	HQ & HQ trp.....	17-52D	(2.08)	(5.41)	(7.49)
6	3 armd cav sq.....	17-55D	(90.51)	(565.89)	(656.40)
7	Avn co.....	1-67D	(2.21)	(0.00)	(2.21)

5.36. Ammunition Supply Data—Artillery Units (Nondivisional)*

a. Basic Load.

(1) Air defense artillery.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
	HQ & HQ BTRY, ADA BDE (TOE 44-101C)											
2	Carbine, cal .30-----	90	0.036	82	7,380	45	132.84	45	132.84			265.68
3	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	7	3,710			530	1,446.90			1,446.90
4	Launcher, rkt, 3.5-in.-----	6	17.700	2	12	6	212.40					212.40
5	Pistol, semiauto, cal .45-----	21	0.057	8	168	21	9.58					9.58
6	Rifle, U.S. cal .30-----	120	0.095	55	6,600	48	250.80	72	376.20			627.00
	HQ & HQ BTRY, ADA GP ¹ (TOE 44-12C)											2,561.56 = 1.28 tons
7	Carbine, cal .30-----	90	0.036	63	5,670	45	102.06	45	102.06			204.12
8	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	7	3,710			530	1,446.90			1,446.90
9	Launcher, rkt, 3.5-in.-----	6	17.700	4	24	6	424.80					424.80
10	Pistol, semiauto, cal .45-----	21	0.057	7	147	21	8.38					8.38
11	Rifle, U.S. cal .30-----	120	0.095	40	4,800	48	182.40	72	273.60			456.00
	ADA AW BN, SP (TOE 44-85D)											2,540.20 = 1.27 tons
12	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	13	6,890			530	2,687.10			2,687.10
13	Gun, submach, cal .45-----	90	0.057	1	90	45	2.57	45	2.57			5.14
14	Gun, twin 40-mm, SP-----	720	6.600	64	46,080			560	236,544.00	160	67,584.00	304,128.00
15	Launcher, rkt, 3.5-in.-----	6	17.700	20	120			6	2,124.00			2,124.00
16	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17					13.17

* For classified data, see FM 101-10, part III, chapter 5, section 11.

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
17	Rifle, semiauto, 7.62-mm, lt bbl.	120	0.081	662	79,440	60	3,217.32	60	3,217.32			6,434.64
	ADA MSL BN, HAWK (MBL) (TOE 44-235T)											315,392.05 = 157.70 tons
18	Gun, mach, cal .50, Bng, hv bbl, flex.	530	0.390	28	14,840			530	5,787.60			5,787.60
19	Launcher, GM/HAWK ²			24								
20	Launcher, rkt, 3.5-in.	6	17.700	19	114			6	2,017.80			2,017.80
21	Pistol, semiauto, cal .45	21	0.057	9	189	21	10.77					10.77
22	Rifle, semiauto, 7.62-mm, lt bbl.	120	0.081	492	59,040	60	2,391.12	60	2,391.12			4,782.24
	ADA MSL BN, NIKE-HERCULES (TOE 44-535T)											³ 12,598.41 = 6.30 tons
23	Gun, mach, cal .50, Bng, hv bbl, flex.	530	0.390	37	19,610			530	7,647.90			7,647.90
24	Launcher-loader, GM/NIKE- HERCULES ²			36								
25	Launcher, rkt, 3.5-in.	6	17.700	23	138			6	2,442.60			2,442.60
26	Pistol, semiauto, cal .45	21	0.057	9	189	21	10.77					10.77
27	Rifle, semiauto, 7.62-mm, lt bbl.	120	0.081	685	82,200	60	3,329.10	60	3,329.10			6,658.20
	ADA MSL BN, NIKE-AJAX (TOE 44-435E)											⁴ 16,759.47 = 8.38 tons
28	Gun, mach, cal .50, Bng, hv bbl, flex.	530	0.390	37	19,610			530	7,647.90			7,647.90
29	Launcher-loader, GM/NIKE I ²			36								
30	Launcher, rkt, 3.5-in.	6	17.700	35	210			6	3,717.00			3,717.00
31	Pistol, semiauto, cal .45	21	0.057	4	84	21	4.79					4.79
32	Rifle, semiauto, 7.62-mm, lt bbl.	120	0.081	678	81,360	60	3,295.08	60	3,295.08			6,590.16

	ADA OP DET (TOE 44-7R)											⁵ 17,959.85 = 8.98 tons
33	Carbine, cal .30-----	90	0.036	19	1,710	45	30.78	45	30.78	-----	-----	61.56
34	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	1	530	-----	-----	530	206.70	-----	-----	206.70
35	Gun, submach, cal .45-----	90	0.057	9	810	45	23.09	45	23.09	-----	-----	46.18
36	Launcher, rkt, 3.5-in-----	6	17.700	1	6	-----	-----	6	106.20	-----	-----	106.20
37	Pistol, semiauto, cal .45-----	21	0.057	1	21	21	1.20	-----	-----	-----	-----	1.20
38	Rifle, U.S., cal .30-----	120	0.095	24	2,880	48	109.44	72	164.16	-----	-----	273.60
												695.44 = 0.35 tons
	ADA OP DET, MSL MONITOR (TOE 44-57T)											
39	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	1	530	-----	-----	530	206.70	-----	-----	206.70
40	Launcher, rkt, 3.5-in-----	6	17.700	1	6	-----	-----	6	106.20	-----	-----	106.20
41	Pistol, semiauto, cal .45-----	21	0.057	1	21	21	1.20	-----	-----	-----	-----	1.20
42	Rifle, semiauto, 7.62-mm, lt bbl-----	120	0.081	48	5,760	48	186.62	72	279.94	-----	-----	466.56
												780.66 = 0.39 tons

¹ Does not include AAOC section.² For classified data pertaining to this unit, see FM 101-10, part III.³ Does not include line 19.⁴ Does not include line 24.⁵ Does not include line 29.

(2) Field artillery.

1	2	3	4	5	6	7	8	9	10	11	12
Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
					Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
HQ & HQ BTRY, ARMY ARTY (TOE 6-601 (TENT)) (Data pertaining to HQ & HQ btry, army arty, not available.) HQ & HQ BTRY, CORPS ARTY OR ABN CORPS ARTY (TOE 6-501D)											
2 Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	2	1,060			530	413.40			413.40
3 Gun, mach, 7.62-mm, lt-weight, GP	530	0.080	2	1,060			530	84.80			84.80
4 Launcher, rkt, 3.5-in.....	6	17.700	3	18	6	318.60					318.60
5 Pistol, semiauto, cal .45.....	21	0.057	14	294	21	16.76					16.76
6 Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	145	17,400	60	626.40	60	626.40			1,252.80
											2,086.36 = 1.04 tons
HQ & HQ BTRY, FA GP (TOE 6-401D)											
7 Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	1	530			530	206.70			206.70
8 Gun, mach, 7.62-mm, lt-weight, GP	530	0.080	2	1,060			530	84.80			84.80
9 Launcher, rkt, 3.5-in.....	6	17.700	2	12	6	212.40					212.40
10 Pistol, semiauto, cal .45.....	21	0.057	9	189	21	10.78					10.78
11 Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	100	12,000	60	432.00	60	432.00			864.00
											1,378.68 = 0.69 tons
FA HOW BN, 105-MM, TOWED ¹ (TOE 6-125C)											
12 Carbine, cal .30.....	90	0.036	227	20,430	45	367.74	45	367.74			735.48
13 Gun, mach, cal .30.....	530	0.086	10	5,300			530	455.80			455.80
14 Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	20	10,600			530	4,134.00			4,134.00
15 Gun, submach, cal .45.....	90	0.057	61	5,490	45	156.47	45	156.47			312.94

16	Howitzer, 105-mm, on carriage-----	250	60.000	18	4,500	-----	-----	60	64,800.00	190	205,200.00	270,000.00
17	Launcher, rkt, 3.5-in.-----	6	17.700	38	228	6	4,035.60	-----	-----	-----	-----	4,035.60
18	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17	-----	-----	-----	-----	13.17
19	Rifle, U.S., cal .30-----	120	0.095	271	32,520	48	1,235.76	48	1,235.76	24	617.88	3,089.40
FA HOW BN, 105-MM, SP ² (TOE 6-315D)												282,776.39 = 141.39 tons
20	Gun, mach, 7.62-mm, lt-weight, GP-----	530	0.080	30	15,900	-----	-----	530	1,272.00	-----	-----	1,272.00
21	Howitzer, 105-mm, SP-----	250	60.000	18	4,500	-----	-----	56	60,480.00	194	209,520.00	270,000.00
22	Launcher, rkt, 3.5-in.-----	6	17.700	23	138	6	2,442.60	-----	-----	-----	-----	2,442.60
23	Pistol, semiauto, cal .45-----	21	0.057	26	546	21	31.12	-----	-----	-----	-----	31.12
24	Rifle, semiauto, 7.62-mm, lt bbl-----	120	0.072	495	59,400	60	2,138.40	40	1,425.60	20	712.80	4,276.80
FA HOW BN, 155-MM, TOWED ¹ (TOE 6-135C)												278,022.52 = 139.01 tons
25	Carbine, cal .30-----	90	0.036	216	19,440	45	349.92	45	349.92	-----	-----	699.84
26	Gun, mach, cal .30-----	530	0.086	10	5,300	-----	-----	530	455.80	-----	-----	455.80
27	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	20	10,600	-----	-----	530	4,134.00	-----	-----	4,134.00
28	Gun, submach, cal .45-----	90	0.057	60	5,400	45	153.90	45	153.90	-----	-----	307.80
29	Howitzer, 155-mm, on carriage-----	150	112.000	18	2,700	-----	-----	24	48,384.00	126	234,016.00	302,400.00
30	Launcher, rkt, 3.5-in.-----	6	17.700	38	228	6	4,035.60	-----	-----	-----	-----	4,035.60
31	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17	-----	-----	-----	-----	13.17
32	Rifle, U.S., cal .30-----	120	0.095	324	38,880	48	1,477.44	48	1,477.44	24	738.72	3,693.60
FA HOW BN, 155-MM, SP ¹ (TOE 6-325C)												315,739.81 = 157.87 tons
33	Carbine, cal .30-----	90	0.036	207	18,630	45	335.34	45	335.34	-----	-----	670.68
34	Gun, mach, cal .30-----	530	0.086	10	5,300	-----	-----	530	455.80	-----	-----	455.80
35	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	13	6,890	-----	-----	530	2,687.10	-----	-----	2,687.10
36	Gun, submach, cal .45-----	90	0.057	49	4,410	45	125.69	45	125.69	-----	-----	251.38
37	Howitzer, 155-mm, SP-----	150	112.000	18	2,700	-----	-----	24	48,384.00	126	254,016.00	302,400.00
38	Launcher, rkt, 3.5-in.-----	6	17.700	35	210	6	3,717.00	-----	-----	-----	-----	3,717.00
39	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17	-----	-----	-----	-----	13.17

See footnotes at end of table.

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
40	Rifle, U.S., cal .30-----	120	0.095	367	44,040	48	1,673.52	48	1,673.52	24	836.76	4,183.80
	FA HOW BN, 8-IN, TOWED (TOE 6-415D)											314,378.93 = 157.19 tons
41	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	4	2,120			530	826.80			826.80
42	Gun, mach, 7.62-mm, lt-weight, GP-----	530	0.080	20	10,600			530	848.00			848.00
43	Howitzer, 8-in, on carriage-----	100	253.000	12	1,200			20	60,720.00	80	242,880.00	303,600.00
44	Launcher, rkt, 3.5-in-----	6	17.700	30	180	6	3,168.00					3,168.00
45	Pistol, semiauto, cal .45-----	21	0.057	11	231	21	13.17					13.17
46	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl-----	260	0.072	28	7,280	120	241.92	100	201.60	40	80.64	524.16
47	Rifle, semiauto, 7.62-mm, lt bbl-----	120	0.072	539	64,680	60	2,328.48	40	1,552.32	20	776.16	4,656.96
	FA HOW BN, 8-IN., SP ³ (TOE 6-415D)											313,637.09 = 156.82 tons
48	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	4	2,120			530	826.80			826.80
49	Gun, mach, 7.62-mm, lt-weight, GP-----	530	0.080	17	9,010			530	720.80			720.80
50	Gun, submach, cal .45-----	90	0.057	1	90	45	2.57	45	2.57			5.14
51	Howitzer, 8-in., SP-----	100	253.000	12	1,200			12	36,432.00	88	267,168.00	303,600.00
52	Launcher, rkt, 3.5-in-----	6	17.700	30	180	6	3,168.00					3,168.00
53	Pistol, semiauto, cal .45-----	21	0.057	13	273	21	15.56					15.56
54	Rifle, auto-semiauto, 7.62-mm, se- lective, hv bbl-----	260	0.072	28	7,280	120	241.92	100	201.60	40	80.64	524.16
55	Rifle, semiauto, 7.62-mm, lt bbl-----	120	0.072	488	58,560	60	2,108.16	40	1,405.44	20	702.72	4,216.32
	FA MSL BN, CORPORAL ⁴ (TOE 6-545E)											313,076.78 = 156.54 tons
56	Gun, mach, 7.62-mm, lt-weight, GP-----	530	0.080	13	6,890			530	551.20			551.20
57	Launcher, GM/CORPORAL II-----	(5)		3								

58	Launcher, rkt, 3.5-in.....	6	17.700	13	78	6	1,380.60					1,380.60
59	Pistol, semiauto, cal .45.....	21	0.057	9	189	21	10.77					10.77
60	Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	271	32,520	48	936.58	48	936.58	24	468.29	2,341.45
FA MSL BN, HONEST JOHN RKT, SP (TOE 6-525D)												⁶⁴ 2,284.02 = 2.14 tons
61	Gun, mach, 7.62-mm, lt-weight, GP.....	530	0.080	15	7,950			530	636.00			636.00
62	Launcher, 762-mm, rkt, trk-mtd.....	(7)		4								
63	Launcher, rkt, 3.5-in.....	6	17.700	12	72	6	1,274.40					1,274.40
64	Pistol, semiauto, cal .45.....	21	0.057	5	105	21	5.99					5.99
65	Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	225	27,000	60	972.00	60	972.00			1,944.00
FA MSL BN, LACROSSE, SP ⁴ (TOE 6-585T)												⁸³ 8,860.39 = 1.93 tons
66	Gun, mach, 7.62-mm, lt-weight, GP.....	530	0.080	16	8,480			530	678.40			678.40
67	Launcher, helical, rail, GM, trk- mtd/LACROSSE.....	(9)		4								
68	Launcher, rkt, 3.5-in.....	6	17.700	14	84	6	1,486.80					1,486.80
69	Pistol, semiauto, cal .45.....	21	0.057	10	210	21	11.97					11.97
70	Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	257	30,840	60	1,110.24	60	1,110.24			2,220.48
FA GUN BN, 280-MM (TOE 6-535C)												¹⁰⁴ 3,397.65 = 2.20 tons
71	Carbine, cal .30.....	90	0.036	255	22,950	45	413.10	45	413.10			826.20
72	Gun, mach, cal .30.....	530	0.086	10	5,300			530	2,429.50			2,429.50
73	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	8	4,240			530	1,653.60			1,653.60
74	Gun, submach, cal .45.....	90	0.057	1	90	45	2.57	45	2.57			5.14
75	Gun, 280-mm, on carriage.....	(11)		6								
76	Launcher, rkt, 3.5-in.....	6	17.700	21	126	6	2,230.20					2,230.20
77	Pistol, semiauto, cal .45.....	21	0.057	12	252	21	14.36					14.36
78	Rifle, U.S., cal .30.....	120	0.095	198	23,760	48	902.88	48	902.88	24	451.44	2,257.20
												¹²⁹ 4,416.20 = 4.71 tons

See footnotes at end of table.

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
	FA OBSN BN (TOE 6-575C)											
79	Carbine, cal .30.....	90	0.036	285	25,650	45	461.70	45	461.70			923.40
80	Gun, mach, cal .30.....	530	0.086	8	4,240			530	364.64			364.64
81	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	28	14,840			530	5,787.60			5,787.60
82	Gun, submach, cal .45.....	90	0.057	131	11,790	45	336.02	45	336.02			672.04
83	Launcher, rkt, 3.5-in.....	6	17.700	21	126	6	2,230.02					2,230.02
84	Pistol, semiauto, cal .45.....	21	0.057	12	252	21	14.36					14.36
85	Rifle, U.S., cal .30.....	120	0.095	344	41,280	48	1,568.64	48	1,568.64	24	784.32	3,921.60
												13,913.66 = 6.96 tons
	FA SLT BTRY (TOE 6-558D)											
86	Gun, mach, 7.62-mm, lt-weight, GP.....	530	0.080	23	12,190			530	975.20			975.20
87	Launcher, rkt, 3.5-in.....	6	17.700	4	24	6	424.80					424.80
88	Pistol, semiauto, cal .45.....	21	0.057	1	21	21	1.20					1.20
89	Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	165	19,800	60	712.80	60	712.80			1,425.60
												2,826.80 = 1.41 tons
	FA MSL GP, REDSTONE (TOE 6-630T)											
90	Gun, mach, 7.62-mm, lt-weight, GP.....	530	0.080	31	16,430			530	1,314.40			1,314.40
91	Launcher, GM, XM30.....	(13)		2								
92	Launcher, rkt, 3.5-in.....	6	17.700	17	102	6	1,805.40					1,805.40
93	Pistol, semiauto, cal .45.....	21	0.057	17	357	21	20.35					20.35
94	Rifle, semiauto, 7.62-mm, lt bbl.....	120	0.072	598	71,760	60	2,583.36	60	2,583.36			5,166.72
												148,306.87 = 4.15 tons

See notes on page 307.

¹ Includes med det.

² Includes avn sec and air observer augmentations.

³ See FM 101-10, part III, paragraph 1.10.

⁴ Includes security sec augmentation.

⁵ See FM 101-10, part III, paragraph 1.4.

⁶ Does not include line 57.

⁷ See FM 101-10, part III, paragraph 1.5.

⁸ Does not include line 62.

⁹ See FM 101-10, part III, paragraph 1.6.

¹⁰ Does not include line 67.

¹¹ See FM 101-10, part III, paragraph 1.9.

¹² Does not include line 75.

¹³ See FM 101-10, part III, paragraph 1.3.

¹⁴ Does not include line 91.

b. Resupply Capacity, Organic Ammunition Vehicles. (Prime movers of weapons and weapon carriers not included.)

	1	2	3	4	5	6	7	8
1	Unit	Truck, 2½-ton, and trailer, 1½-ton	Truck, 2½-ton, and trailer, M10A1 ¹	Truck, cargo, 5-ton	Truck, cargo, 5-ton, and trailer, 1½-ton	Truck, cargo, 5-ton, and trailer, M10A1 ¹	Tractor, M5A4, ² and trailer, M10A1 ¹	Capacity (tons)
2	FA how bn, 105-mm, towed		21					81.27
3	FA how bn, 105-mm, SP		21					81.27
4	FA how bn, 155-mm, towed		12			9	3	112.02
5	FA how bn, 155-mm, SP		12			18		161.10
6	FA how bn, 8-in., towed			6	12			108.00
7	FA how bn, 8-in., SP			6		12		106.44
8	FA gun bn, 280-mm	(³)		16				120.00

¹Trailer, M10A1, carries 1.37 tons ammunition (56 rounds 105-mm, 23 rounds 155-mm).

²Tractor, M5, carries 24 rounds 155-mm ammunition (1.38 tons), 58 rounds 105-mm (1.38 tons).

³Four trucks, 20 trailers.

5.37. Ammunition Supply Data—Chemical Units—Basic Load

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	HQ & HQ DET, CML SMOKE GENR BN (TOE 3-266D)											
2	Gun, submach, cal .45-----	90	0.057	1	90	90	5.13	-----	-----	-----	-----	5.13
3	Pistol, semiauto, cal .45-----	21	0.057	2	42	21	2.39	-----	-----	-----	-----	2.39
4	Rifle, semiauto, 7.62-mm, lt bbl----	120	0.072	19	2,280	60	82.08	60	82.08	-----	-----	164.16
												171.68 = 0.09 tons
	CML SMOKE GENR CO (TOE 3-267D)											
5	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	2	1,060	-----	-----	530	413.40	-----	-----	413.40
6	Gun, mach, 7.62-mm, lt-weight, GP-----	530	0.080	4	2,120	-----	-----	530	169.60	-----	-----	169.60
7	Gun, submach, cal .45-----	90	0.057	15	1,350	60	51.30	30	25.65	-----	-----	76.95
8	Launcher, rkt, 3.5-in-----	6	17.700	4	24	-----	-----	6	424.80	-----	-----	424.80
9	Rifle, auto-semiauto, 7.62-mm, se- lective, hv bbl-----	260	0.072	5	1,300	120	43.20	100	36.00	40	14.40	93.60
10	Rifle, semiauto, 7.62-mm, lt bbl----	120	0.072	118	14,160	60	509.76	60	509.76	-----	-----	1,019.52
11	Generator, smoke, mech, pulse-jet, M3 series. ¹ -----	24	455.830	48	2192	-----	-----	3	65,639.52	1	21,879.84	87,519.36
		34	25.000	48	3192	-----	-----	1	1,200.00	3	3,600.00	4,800.00
												94,517.23 = 47.26 tons

¹ A single mechanical smoke generator operating at maximum capacity consumes approximately 1,200 gal of fog oil per 24-hour day.² 55-gal drum (fog oil).³ 5-gal gas cans (80-octane gas).

5.38. Ammunition Supply Data—Engineer Units (Nondivisional)—Basic Load

L	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	ENGR CMBT BN, ARMY (TOE 5-35D)											
2	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	18	9,540			530	3,720.60			3,720.60
3	Gun, mach, 7.62-mm, lt-weight, GP	6,500	0.080	20	130,000	3,250	5,200.00	2,250	3,600.00	1,000	1,600.00	10,400.00
4	Launcher, rkt, 3.5-in.-----	12	17.700	34	408			12	7,221.60			7,221.60
5	Pistol, semiauto, cal .45-----	21	0.057	10	210	21	11.97					11.97
6	Rifle, semiauto, 7.62-mm, lt bbl----	340	0.072	602	204,680	100	4,334.40	120	5,201.28	120	5,201.28	14,736.96
												36,091.13 = 18.05 tons

5.39. Ammunition Supply Data—Signal Units (Nondivisional)—Basic Load

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
	CORPS SIG BN OR SIG BN, ABN CORPS (TOE 11-15D)											
2	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	8	4,240			530	1,653.60			1,653.60
3	Launcher, rkt, 3.5-in.....	4	17.700	14	56			4	991.20			991.20
4	Pistol, semiauto, cal .45.....	21	0.057	20	420	21	23.94					23.94
5	Rifle, semiauto, 7.62-mm, lt bbl.....	100	0.081	670	67,000	60	3,256.20	40	2,170.80			5,427.00
												8,095.74 = 4.05 tons
	SIG CONST BN (TOE 11-25D)											
6	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	53	28,090			530	10,955.10			10,955.10
7	Launcher, rkt, 3.5-in.....	4	17.700	22	88			4	1,557.60			1,557.60
8	Pistol, semiauto, cal .45.....	21	0.057	7	147	21	8.38					8.38
9	Rifle, semiauto, 7.62-mm, lt bbl.....	100	0.081	877	87,700	60	4,262.22	40	2,841.48			7,103.70
												19,624.78 = 9.81 tons
	HQ & HQ DET, CMBT AREA SIG GP, ARMY (TOE 11-32D)											
10	Gun, submach, cal .45.....	90	0.057	14	1,260	60	47.88	30	23.94			71.82
11	Launcher, rkt, 3.5-in.....	4	17.700	5	20			4	354.00			354.00
12	Pistol, semiauto, cal .45.....	21	0.057	12	252	21	14.36					14.36
13	Rifle, semiauto, 7.62-mm, lt bbl.....	100	0.081	37	3,700	60	179.82	40	119.88			299.70
												739.88 = 0.37 tons

SIG CABLE CONST BN (TOE 11-45D)											
14	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	84	44,520			530	17,362.80		17,362.80
15	Launcher, rkt, 3.5-in.....	4	17.700	15	60			4	1,062.00		1,062.00
16	Pistol, semiauto, cal .45.....	21	0.057	8	168	21	9.58				9.58
17	Rifle, semiauto, 7.62-mm, lt bbl.....	100	0.081	866	86,600	60	4,208.76	40	2,805.84		7,014.60
											25,448.98 = 12.72 tons
SIG AIR PHOTO REPRO AND DLVR CO (TOE 11-54D)											
18	Carbine, cal .30.....	60	0.036	89	5,340	60	192.24				192.24
19	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	1	530			530	206.70		206.70
20	Gun, submach, cal .45.....	90	0.057	8	720	60	27.36	30	13.68		41.04
21	Launcher, rkt, 3.5-in.....	4	17.700	2	8			4	141.60		141.60
22	Pistol, semiauto, cal .45.....	21	0.057	16	336	21	19.15				19.15
23	Rifle, US, cal .30.....	96	0.095	33	3,168	48	150.48	48	150.48		300.96
											901.69 = 0.45 tons
HQ & HQ DET, CMBT EW SIG BN, CORPS (TOE 11-66D)											
24	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	3	1,590			530	620.10		620.10
25	Launcher, rkt, 3.5-in.....	4	17.700	3	12			4	212.40		212.40
26	Pistol, semiauto, cal .45.....	21	0.057	4	84	21	4.79				4.79
27	Rifle, semiauto, 7.62-mm, lt bbl.....	100	0.081	38	3,800	60	184.68	40	123.12		307.80
											1,145.09 = 0.57 tons
CMBT EW SIG CO, INF (TOE 11-67D)											
28	Gun, mach, cal .50, Bng, hv bbl, flex.....	530	0.390	2	1,060			530	41.34		41.34
29	Launcher, rkt, 3.5-in.....	4	17.700	1	4			4	70.80		70.80
30	Pistol, semiauto, cal .45.....	21	0.057	10	210	21	11.97				11.97

1	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpm	Wt per rd (lb)	Total wpm	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	Rd per wpm	Total wt (lb)	
31	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	155	15,500	60	753.30	40	502.20			1,255.50
	CMBT EW SIG CO, ARMD (TOE 11-68D)											1,379.61 = 0.69 tons
32	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	2	1,060			530	41.34			41.34
33	Launcher, rkt, 3.5-in.	4	17.700	1	4			4	70.80			70.80
34	Pistol, semiauto, cal .45	21	0.057	10	210	21	11.97					11.97
35	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	130	13,000	60	631.80	40	421.20			1,053.00
	CMBT AREA SIG BN, ARMY (TOE 11-851D)											1,177.11 = 0.59 tons
36	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	14	7,420			530	2,893.80			2,893.80
37	Launcher, rkt, 3.5-in.	4	17.700	13	52			4	920.40			920.40
38	Pistol, semiauto, cal .45	21	0.057	8	168	21	9.58					9.58
39	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	801	80,100	60	3,892.86	40	2,595.24			6,488.10
	SIG COMM CEN OP CO (TOE 11-137D)											10,311.88 = 5.16 tons
40	Gun, mach, cal .50, Bng, hv bbl, flex	530	0.390	1	530			530	206.70			206.70
41	Launcher, rkt, 3.5-in.	4	17.700	6	24			4	424.80			424.80
42	Pistol, semiauto, cal .45	21	0.057	1	21	21	1.20					1.20
43	Rifle, semiauto, 7.62-mm, lt bbl	100	0.081	290	29,000	60	1,409.40	40	939.60			2,349.00
												2,981.70 = 1.49 tons

ARMY SIG SUP AND MAINT BN (TOE 11-1551D)											
44	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	16	8,480	-----	-----	530	3,307.20	-----	3,307.20
45	Launcher, rkt, 3.5-in-----	4	17.700	17	68	-----	-----	4	1,203.60	-----	1,203.60
46	Pistol, semiauto, cal .45-----	21	0.057	8	168	21	9.58	-----	-----	-----	9.58
47	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	834	83,400	60	4,053.24	40	2,702.16	-----	6,755.40
											11,275.78 = 5.64 tons
AD EW SIG BN, ARMY (TOE 11-165D)											
48	Gun, mach, cal .50, Bng, hv bbl, flex-----	530	0.390	27	14,310	-----	-----	530	5,580.90	-----	5,580.90
49	Launcher, rkt, 3.5-in-----	4	17.700	27	108	-----	-----	4	1,911.60	-----	1,911.60
50	Pistol, semiauto, cal .45-----	21	0.057	10	210	21	11.97	-----	-----	-----	11.97
51	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	1,060	106,000	60	5,151.60	40	3,434.40	-----	8,586.00
											16,090.47 = 8.05 tons

314 5.40. Ammunition Supply Data—U.S. Army Security Agency Units—Basic Load

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit and type munition	Rd per wpn	Wt per rd (lb)	Total wpn	Total rd	Carried on individual		Carried on vehicle		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	HQ, H&S CO, USASA GP (TOE 32-52P)											
2	Grenade, hand, frag-----		2.100		550	550	1,155.00					1,155.00
3	Grenade, hand, incd, TH1-----		2.000		210				420.00			420.00
4	Pistol, semiauto, cal .45-----	21	0.057	25	525	21	29.93					29.93
5	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	252	25,200	100	2,041.20					2,041.20
												3,646.13 = 1.82 tons
	HQ & HQ CO, USASA BN (TOE 32-56P)											
6	Grenade, hand, frag-----		2.100		338	338	709.80					709.80
7	Grenade, hand, incd, TH1-----		2.000		140				280.00			280.00
8	Pistol, semiauto, cal .45-----	21	0.057	14	294	21	16.76					16.76
9	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	157	15,700	100	1,271.70					1,271.70
												2,278.26 = 1.14 tons
	USASA OP CO (A) (TOE 32-67P)											
10	Grenade, hand, frag-----		2.100		648	648	1,360.80					1,360.80
11	Grenade, hand, incd, TH1-----		2.000		226				452.00			452.00
12	Pistol, semiauto, cal .45-----	21	0.057	14	294	21	16.76					16.76
13	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	312	31,200	100	2,527.20					2,527.20
												4,356.76 = 2.18 tons
	USASA OP CO (B) (TOE 32-68P)											
14	Grenade, hand, frag-----		2.100		558	558	1,171.80					1,171.80
15	Grenade, hand, incd, TH1-----		2.000		178				356.00			356.00

16	Pistol, semiauto, cal .45-----	21	0.057	14	294	21	16.76	-----	-----	-----	-----	16.76
17	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	267	26,700	100	2,162.70	-----	-----	-----	-----	2,162.70
USASA OP CO (C) (TOE 32-69P) (Data pertaining to USASA op co (C) not available.) USASA PROC CO (TOE 32-77P) (Data pertaining to USASA proc co not available.) USASA SEC CO (TOE 32-78P)												3,707.26 = 1.85 tons
18	Grenade, hand, frag-----		2.100		238	238	499.80	-----	-----	-----	-----	499.80
19	Grenade, hand, incd, TH1-----		2.000		140			-----	280.00	-----	-----	280.00
20	Pistol, semiauto, cal .45-----	21	0.057	3	63	21	3.59	-----	-----	-----	-----	3.59
21	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	118	11,800	100	955.80	-----	-----	-----	-----	955.80
USASA DIV SPT CO (TOE 32-57P)												1,739.19 = 0.87 tons
22	Grenade, hand, frag-----		2.100		278	278	583.80	-----	-----	-----	-----	583.80
23	Grenade, hand, incd, TH1-----		2.000		139			-----	278.00	-----	-----	278.00
24	Pistol, semiauto, cal .45-----	21	0.057	3	63	21	3.59	-----	-----	-----	-----	3.59
25	Rifle, semiauto, 7.62-mm, lt bbl-----	100	0.081	138	13,800	100	1,117.80	-----	-----	-----	-----	1,117.80
												1,983.19 = 0.99 tons

5.41. Ammunition Supply Data—Service Units—Basic Load

For planning purposes, assume service units not likely to become involved in direct combat with the enemy to carry a basic load of ammunition as follows:

1	1	2	3
	Weapon	Rounds per weapon	
		Secure area	Area of guerrilla activity
2	Carbine, cal .30.....	60	90
3	Gun, mach, cal .30.....	1,500	2,000
4	Gun, mach, cal .50, Bng, hv bbl, flex.	420	525
5	Gun, mach, 7.62-mm, lt-weight, GP.	1,760	2,200
6	Gun, submach, cal .45.....	60	90
7	Launcher, rkt, 3.5-in.....	3	3
8	Pistol, semiauto, cal .45.....	21	21
9	Rifle, auto, cal .30, Bng.....	240	500
10	Rifle, auto-semiauto, 7.62-mm, selective, hv bbl.	260	500
11	Rifle, semiauto, 7.62-mm, lt bbl.	100	160
12	Rifle, U.S., cal .30.....	96	144

Section VI. MISCELLANEOUS SUPPLY

5.42. Water Supply

a. Water Requirements.

1	1	2	3	4
	Unit consumer	Conditions of use	Gallons per unit consumer per day ¹	Remarks
2	Man.....	In combat:		For periods not exceeding 3 days—
		Minimum.....	½-1.....	When operational rations are used.
			2.....	When field rations are used.
		Normal.....	3.....	Drinking plus small amount for cooking or personal hygiene.
		March or bivouac.....	2.....	Minimum for all purposes.
		Temporary camp.....	5.....	Desirable for all purposes (does not include bathing).
		Temporary camp with bathing facilities.	15.....	Includes allowance for water-borne sewage system.
		Semipermanent camp....	30-60.....	
		Permanent camp.....	60-100.....	

See footnote at end of table.

	1	2	3	4
1	Unit consumer	Conditions of use	Gallons per unit consumer per day ¹	Remarks
3	Vehicle.....	Level and rolling country.....	$\frac{1}{8}$ - $\frac{1}{2}$	Depending on size of vehicle.
		Mountainous country.....	$\frac{1}{4}$ -1.....	Depending on size of vehicle.
4	Locomotive.....	Standard military.....	Variable.....	150 gallons per train-mile.
		Commercial.....	Variable.....	200 gallons per train-mile.
5	Hospital.....	Drinking and cooking.....	10 per bed.....	Minimum; does not include bathing or water for flushing.
		With waterborne sewage.....	50 per bed.....	Includes water for medical personnel.
6	Impregnating plant, clothing, M2A1.	Maximum impregnating capacity.	4,400.....	Aqueous process. Includes 4,000 gallons for plant operations and 400 gallons for washing and cleaning purposes.
7	QM bakery company (mobile).	Two 10-hour shifts.....	2,600.....	Water for making bread and cleaning baking utensils.
8	QM laundry company.....	Two 10-hour shifts.....	64,000 (4,000 per unit).	
9	QM clothing exchange and bath company	Two 10-hour shifts.....	360,000 (60,000 per unit).	

¹In hot climates, maximum requirements may exceed values given by 15 to 100 percent.

b. Water Equipment Issued to Engineer Units.

	1	2	3	4	5	6	7	8	9	10	11	12
	Unit	Number of sets (each set can equip one water point)	Equipment in each set				Total discharge (GPM)		Total storage capacity (gal) ²	Maximum daily production (gal) ³	Water transport equipment	
			Filter	Pumps		Tanks		Pump ¹	Filtering			
				Number	Dis-charge (GPM)	Number	Capacity (gal)					
2	Abn div engr bn.....	4	600 GPH electric-driven diatomite, component of water purification unit, trailer-mounted.	1 elec-driven.	10	3	1,500	240	40	4,000	48,000	-----
				1 gas-driven.	50							
3	Armd div engr bn....	5	1,500 GPH electric-driven diatomite, component of water purification unit, van-type body mounted.	2 elec-driven.	50	3	1,500	700	125	15,000	150,000	-----
				1 gas-driven.	115							
4	Inf div engr bn.....	5	1,500 GPH electric-driven diatomite, component of water purification unit, van-type body mounted.	2 elec-driven.	50	3	1,500	700	125	15,000	150,000	-----
				1 gas-driven.	115							
5	Engr amph spt comd....	2	35 GPM portable diatomite.....	4	55	3	3,000	400	70	6,000	84,000	-----
6	Engr embt bn, army....	4	1,500 GPH electric-driven diatomite, component of water purification unit, van-type body mounted.	2 elec-driven.	50	3	1,500	700	125	12,000	120,000	-----
				1 gas-driven.	115							
7	Engr const bn.....	2	35 GPM portable diatomite.....	4	55	3	3,000	400	70	6,000	84,000	-----
8	Engr hv const bn.....	1	35 GPM portable diatomite.....	4	55	3	3,000	200	35	3,000	42,000	-----
9	Engr topo bn, army....	1	15 GPM pack diatomite.....	2	30	4	500	45	15	500	18,000	-----
10	Engr topo co, corps....	1	15 GPM pack diatomite.....	2	30	4	500	45	15	500	18,000	-----
11	Engr WS co.....	9	50 GPM portable diatomite.....	5	55	4	3,000	2,295	450	27,000	540,000	12 1,000-gal tank trucks; 4 1,500-gal semitrailers.
12	Water purification team (GF).	1	3,000 GPH electric-driven diatomite, component of water purification unit, van-type body mounted.	2 elec-driven.	50	3	3,000	165	50	9,000	72,000	-----
				1 gas-driven.	115							
13	Water purification team (GG).	4	3,000 GPH electric-driven diatomite, component of water purification unit, van-type body mounted.	2 elec-driven.	50	3	3,000	660	200	36,000	288,000	-----
				1 gas-driven.	115							
14	Water transport team (GH).	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5 900-gal tankers.
15	Well drilling team (GE).	2	Well drilling sets.....	-----	-----	-----	-----	-----	-----	-----	-----	-----

¹ One pump at purification rate; others at full-rated capacity.

² Within each set, only one tank is available for storage. The remaining tanks are used in the treatment process.

³ Since a part of the equipment is normally held in reserve, the maximum daily production is not normally attained.

⁴ Footnote 2 does not apply. All tanks are used for storage.

c. Distillation Units.

1	2	3	4	5	6	7	8	9	10	11	12	
	Distillate capacity		Economy pounds distilled (per lb fuel)	Fuel required		Raw water required (GPH)	Mount- ing	Weight (lb)	Dimensions			
	Type	GPH		GPD ¹	Type				GPH	Length	Width	Height
2	Thermo-compression.....	60	1,200	100	Gasoline	1.0	130	Skid Trailer	4,300 4,700	7 ft 8 in. 12 ft 7 in.	4 ft 6 in. 7 ft 0 in.	5 ft 0 in. 6 ft 2 in.
3	Thermo-compression (Badger).....	150	3,000	150	Gasoline	1.5	325	Skid	6,700	9 ft 6 in.	4 ft 0 in.	6 ft 3 in.
4	Thermo-compression (Cleaver-Brooks).....	150	3,000	150	Gasoline	1.5	325	Skid	6,800	11 ft 2 in.	4 ft 2 in.	5 ft 6 in.
5	Thermo-compression.....	300	6,000	200	Diesel	2.0	600	Skid	13,600	9 ft ½ in.	5 ft 7 in.	6 ft 4 in.

¹ The distillate capacity in GPD is calculated on the basis of the Corps of Engineers, 20-hour day.

d. Water Distribution Equipment.

	1	2
	Equipment	Capacity
1		
2	Trailer, cargo, 1½-ton, 2-wheel.	60 cans filled.
3	Trailer, tank, water, 2-wheel.	400 gal.
4	Truck, cargo, 2½-ton, 6x6, LWB.	100 cans filled.
5	Truck, tank, water, 2½-ton, 6x6.	1,000 gal.
6	Unit kitchen.....	5-gal cans, wt 50 lb (filled).

e. Capacities of Other Water Supply Equipment.

	1	2
	Equipment	Capacity
1		
2	Deep well pumps:	
	Helical rotor-type.....	60 GPM against 250-ft head.
3	Turbine type, 6-inch...	200 GPM against 200-ft head.
4	Percussion well drilling machine.	4- to 6-inch well, 800 ft.
5	Rotary well drilling machine.	4- to 6-inch well, 1,000 ft.
6	Surface pump, centrifugal-type, 2-inch suction and discharge. ¹	55 GPM against total head of 50 ft, including 15-ft suction lift.

¹ Larger pumps are available in depot stock and in special units.

5.43. Adjutant General Supplies

	1	2	3	4	5
	Item	Pounds per man per day	Short tons per 1,000 men per month	Measurement tons per 1,000 men per month	Sacks or pouches of mail per 1,000 men per month
1					
2	Forms and publications: Total forms and publications.	0.033	0.500	1.00	-----
	Postal:				
3	Letter mail ¹	0.028	0.421	² 2.41	³ 24.0
4	Parcel post ⁴	0.166	2.490	⁵ 15.56	-----
5	Postal supplies.	0.011	0.171	⁶ 0.60	-----
6	Total postal..	0.205	3.082	18.57	⁷ 124.5

¹ Moved by air.

² Computed at 10 pouches per measurement ton (estimated).

³ Computed at 35 pounds per pouch of mail (estimated).

⁴ Volume may be expected to increase 2 3 times during October and November because of Christmas mail.

⁵ Computed at 8 sacks per measurement ton (estimated).

⁶ Conversion factor 3.5 measurement tons per short ton (estimated).

⁷ Computed at 40 pounds per sack of mail (estimated).

5.44. Army Exchange Supplies—Consumption and Replenishment

	1	2	3	4
	Item	Pounds per man per day	Short tons per man per month	Measurement tons per man per month
1				
2	Combat zone: Army in amphibious operations ¹	² 0.533	² 0.008	² 0.020
3	Theater: European ³ ⁴	1.428	0.021	0.043
4	Pacific ³ ⁵	1.571	0.024	0.050

¹ Based on Operation OLYMPIC estimates, 150-day period

² Does not include sundries pack issued with rations, 0.369 pound per man per day

³ Data do not include items procured locally by individual exchanges.

⁴ ETO Board Report.

⁵ Southwest Pacific Theater planning data, 1945.

5.45. Paper Supply

	1	2	3	4
	Unit consumer	Consumption tons per day	Maximum production per day	Remarks
1				
2	Psych warfare repro det ¹ (psych warfare best and leaflet bn).	11.25	4,500,000	5¼ in. x 8 in. leaflets printed both sides. ²
3	Psych warfare loudspeaker and leaflet co. ³	5.00	2,000,000	5¼ in. x 8 in. leaflets printed both sides. ²

¹ Based on press equipment authorized by TOE 33-57D.

² For 8 in. x 10½ in. new sheets, production figures are divided by 2.

³ Based on press equipment authorized by TOE 33-77D.

5.46. Special Services Supplies

	1	2	3
1	Item	Short tons per 10,000 men per month	Measurement tons per 10,000 men per month
2	Donated items: Total donated items---	0.15	0.5
3	Recreational: Books and magazines ¹ ---	0.75	1.0
4	Music, theatrical, crafts, and miscellaneous ¹ ----	1.00	2.0
5	Sports ¹ -----	0.75	2.0
6	Total recreational ¹ ----	2.50	5.0

¹ Data do not include items procured locally or items procured from any source with nonappropriated funds as defined in AR 230-5.

5.47. Entertainment Motion Picture Service Supplies

	1	2	3
1	Item	Short tons per 25,000 men per month	Measurement tons per 25,000 men per month
2	Total miscellaneous equip- ment and supplies-----	0.152	0.247

Section VII. SUPPLY REQUIREMENTS

5.48. Day of Supply—Definition

The day of supply, as used in this section, is the estimated weight of supplies required to support one man (soldier or officer, air plus ground) in an oversea theater for 1 day, based on total strengths and maintenance tonnage experience over a long period of time. These factors are not considered as including initial equipment of troop units, but they do include tonnages for project equipment and similar supplies (other than civilian or other relief supplies) which are required to support troops. *The tables shown in paragraphs 5.50 through 5.55 supplement the general consumption and flow charts of paragraph 5.49. They are based on historical data for specific locations, specific types of combat, and specific ground-to-air troop ratios. For information on the establishment of ammunition day of supply and specification of theater stockage levels, see SB 38-26 and AR 11-8.*

5.49. General Consumption and Flow Charts

a. Introduction and Explanation of Charts.

- (1) This paragraph illustrates, with a series of seven graphical charts and supporting tables, the flow of replacement and consumption supplies from

CONUS or local procurement to consumer groups in the theater of operations.

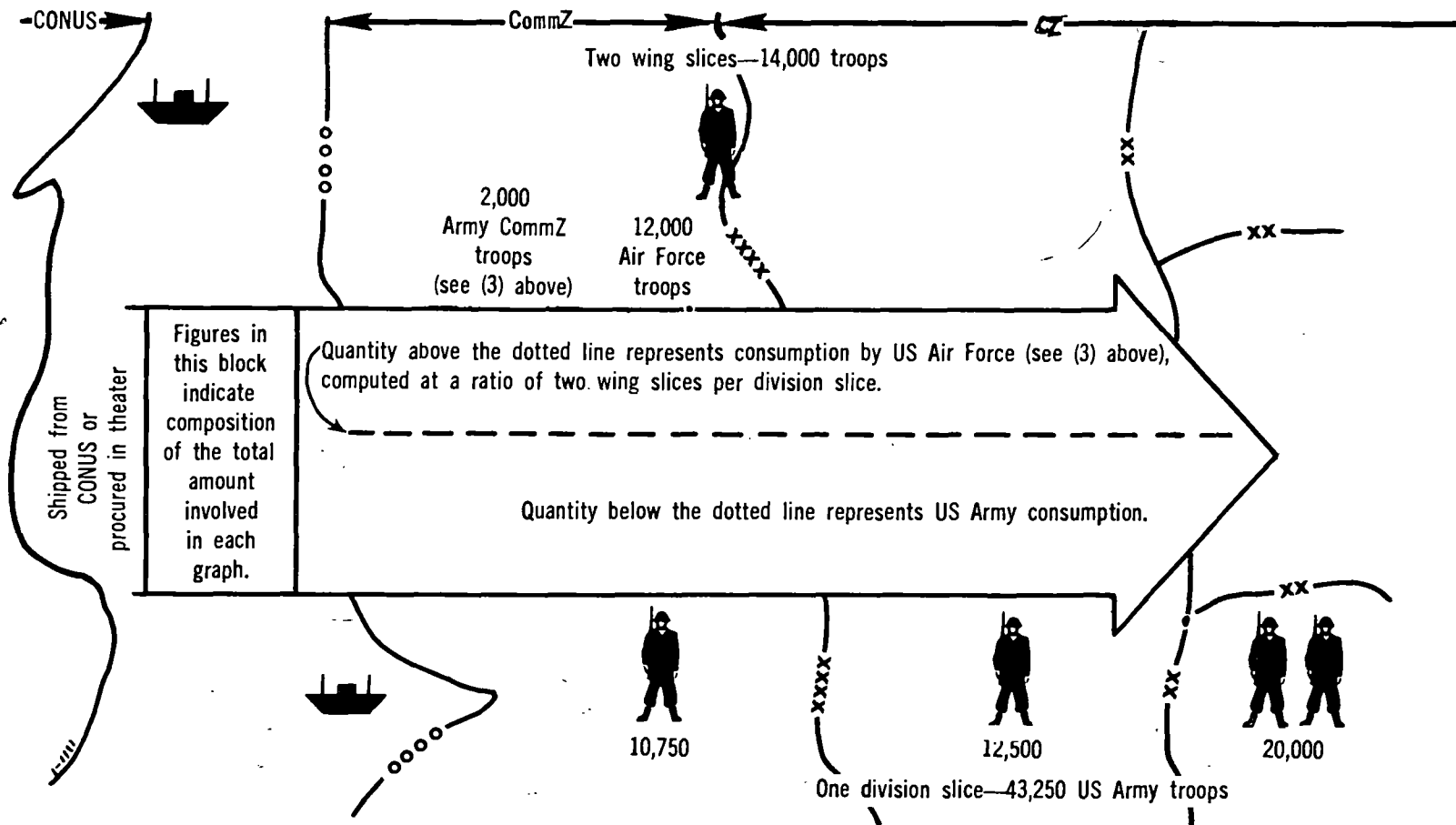
- (2) The unit of measure, *tons per division slice*, is considered the most appropriate for long-range planning for supply of the Army and Air Force in a theater of operations. The division slice is defined (par. 4.6) as including the strength of an average division plus proportionate shares of the total corps, field army zone, and theater overhead units. A troop location ratio has been assumed, illustrated by the human figures shown on the first chart below. Each figure represents approximately 10,000 of the 43,250 men making up the division slice. For illustrative purposes in the following charts, it has been assumed that all divisions in the theater are occupying sectors along the front. In practice, varying proportions of these troops will be in reserve, in rest areas, in transit, or in staging. Also shown in a similar fashion is the proportionate air strength in the theater, based on a ratio of two wing slices (defined in par. 4.6) per division slice.
- (3) The charts include, in addition to the

supplies consumed by the Army in the theater, the quantities of supplies brought into the theater for the use of the U.S. Air Force. All are shown in terms of tons per division slice per day. In all instances, figures based on Air Force strength include those Army troops, part of the wing slice, required within the theater because of the presence of Air Force elements, which are provided Army administrative support. To separate the quantity of supplies brought into the theater for the Army from those supplies brought in for the Air Force, a horizontal dotted line has been drawn.

- (4) The flow of supplies, in terms of tons per division slice per day, shown in each of the charts is supported by *pounds per man per day* data dis-

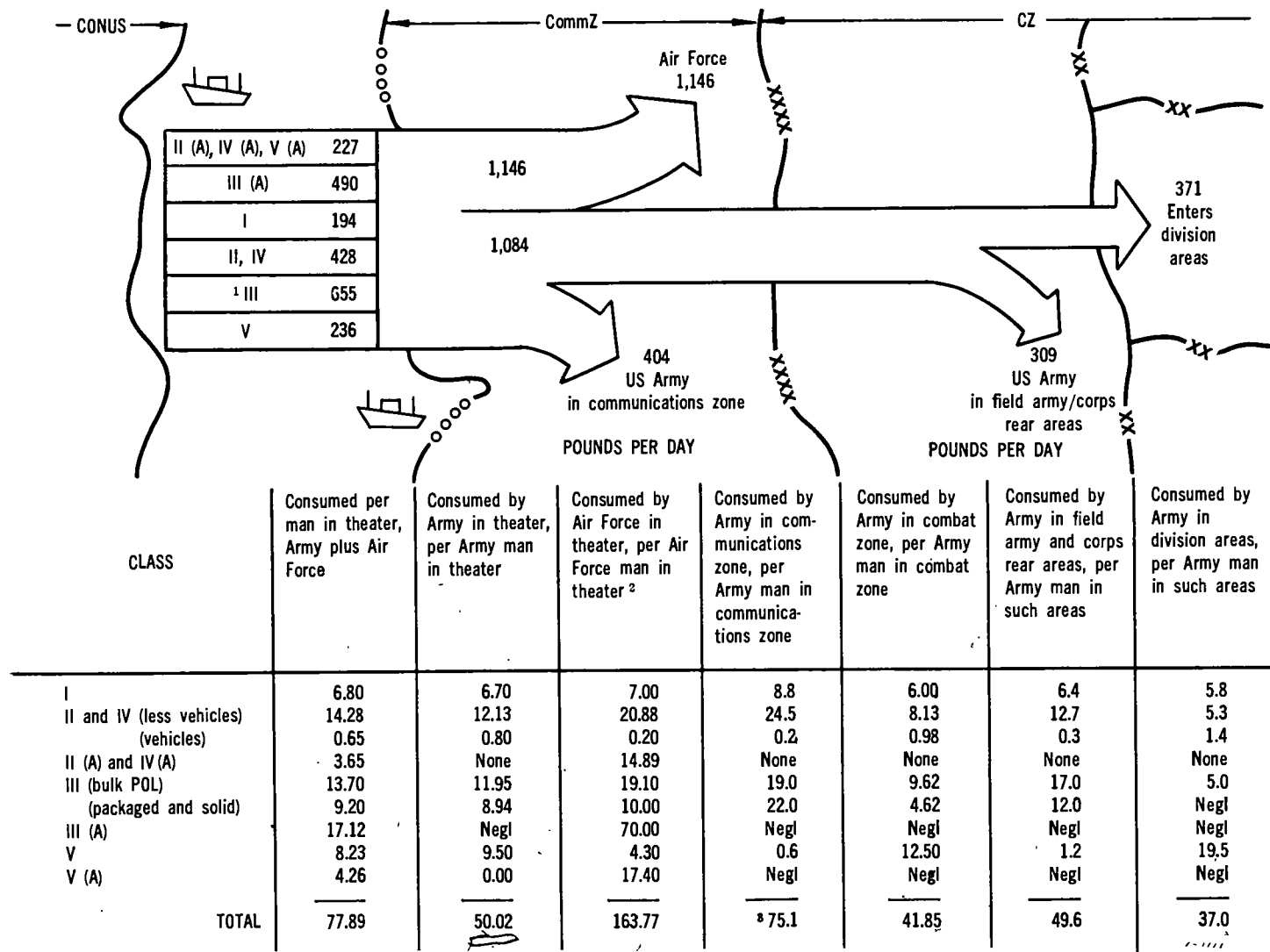
played beneath each chart. These pounds per man per day figures *approximate* those found in the remainder of the chapter.

- (5) *Procurement in the theater* is indicated in each chart, except for classes V and V (A), as a possible source of supply. The quantity thus available would decrease proportionately the amount to be procured from CONUS.
- (6) *Buildup of theater levels* is not included in this series of charts. However, it can be determined easily by a fractional increase in the amounts shown. *For example*, if it is desired to establish a theater reserve of 30 days of supply, and accomplish this buildup in 120 days, a fractional increase of 30/120, or one-fourth, can be made in the amounts shown here.



General Consumption and Flow Chart

b. Short Tons Per Division Slice Per Day—All Classes (based on World War II and Korean experience data).

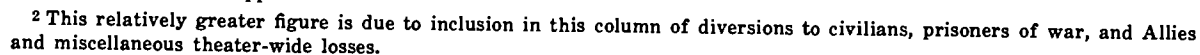


¹ POL tonnages should be adjusted to reflect requirements given in c(2) below when it is considered that data based on assumed mileages and flight times are more valid than World War II and Korean experience data.

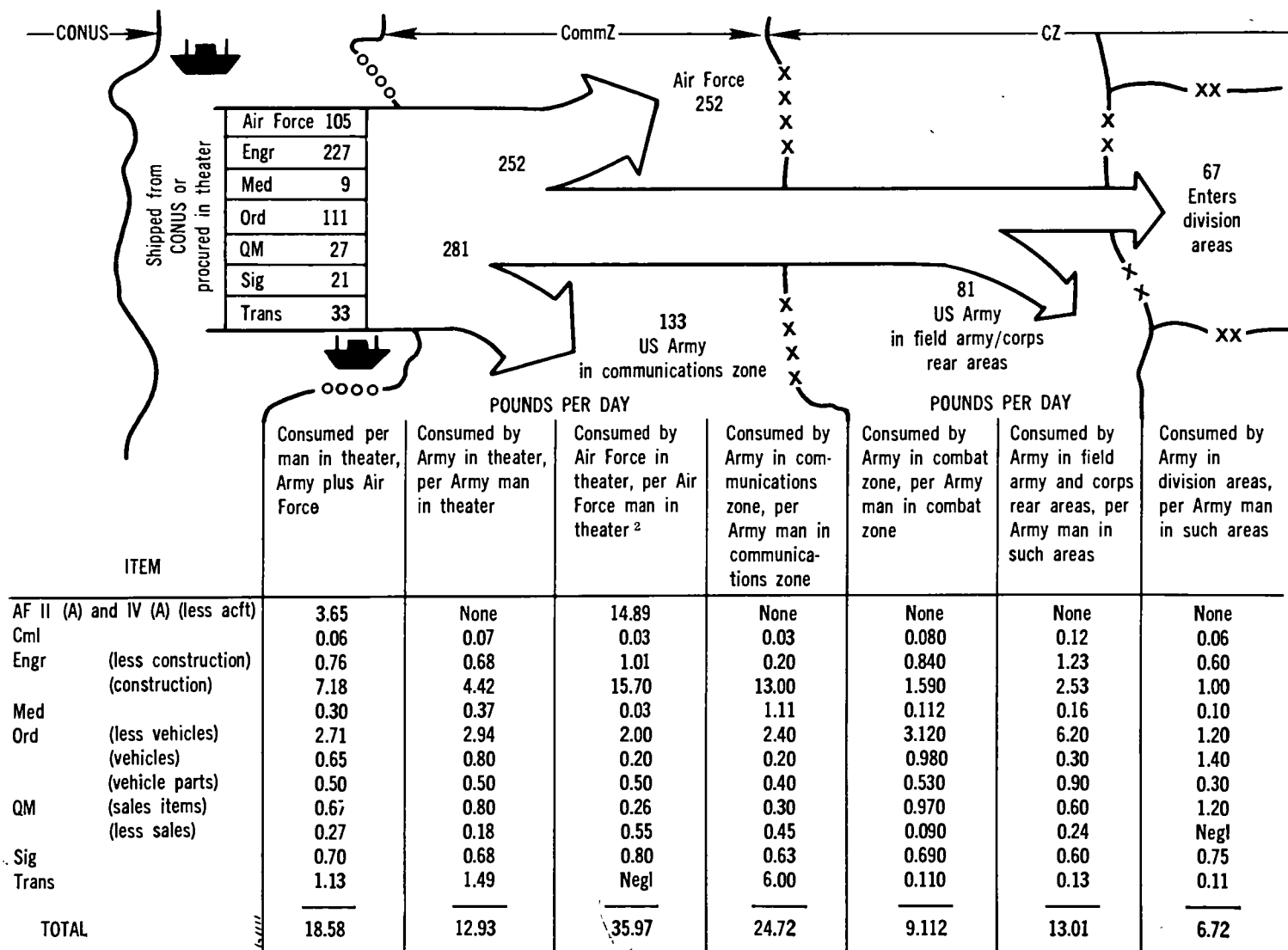
² Includes Army troops required within the theater because of the presence of Air Force elements, which are provided Army administrative support.

³ This relatively greater figure is due to inclusion in this column of diversions to civilians, prisoners of war, and Allies and miscellaneous theater-wide losses.

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d. Short Tons Per Division Slice Per Day—Classes II, IV, II (A), and IV (A)¹ (based on World War II and Korean experience data).

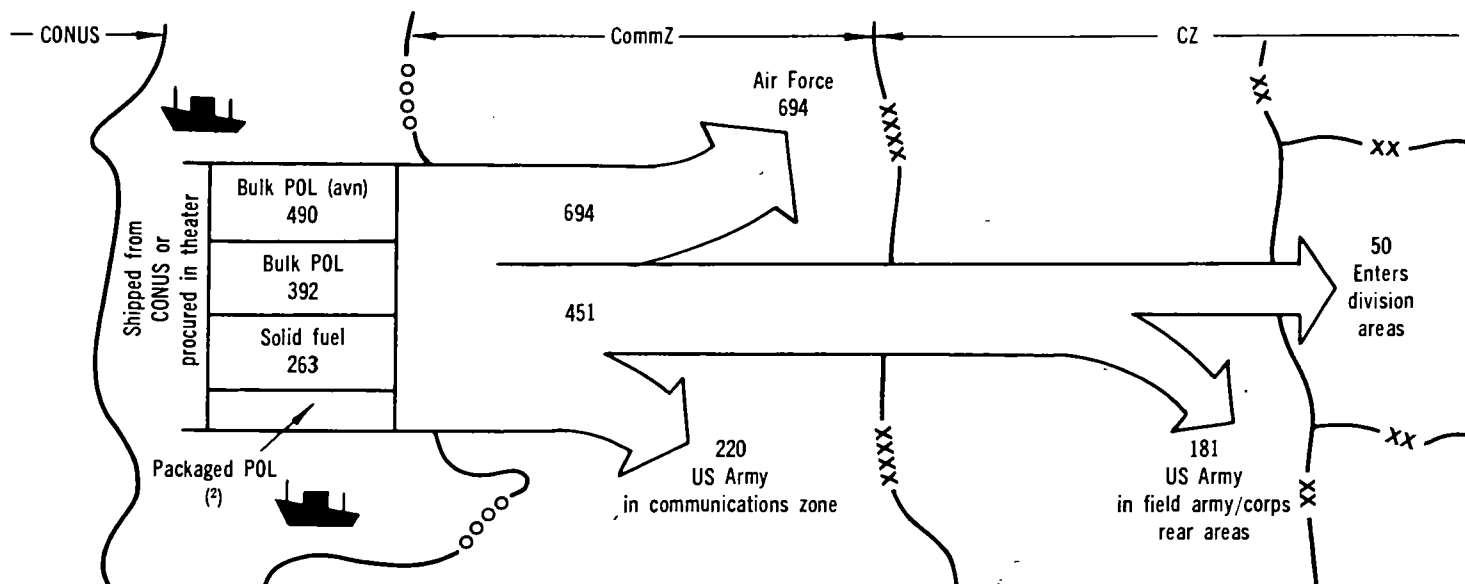


¹ Nongas conditions.

² Includes Army troops required within the theater because of the presence of Air Force elements, which are provided Army administrative support.

e. Classes III and III (A).
experience data).

(1) Short tons per division slice per day—Classes III and III (A) (based on World War II and Korean

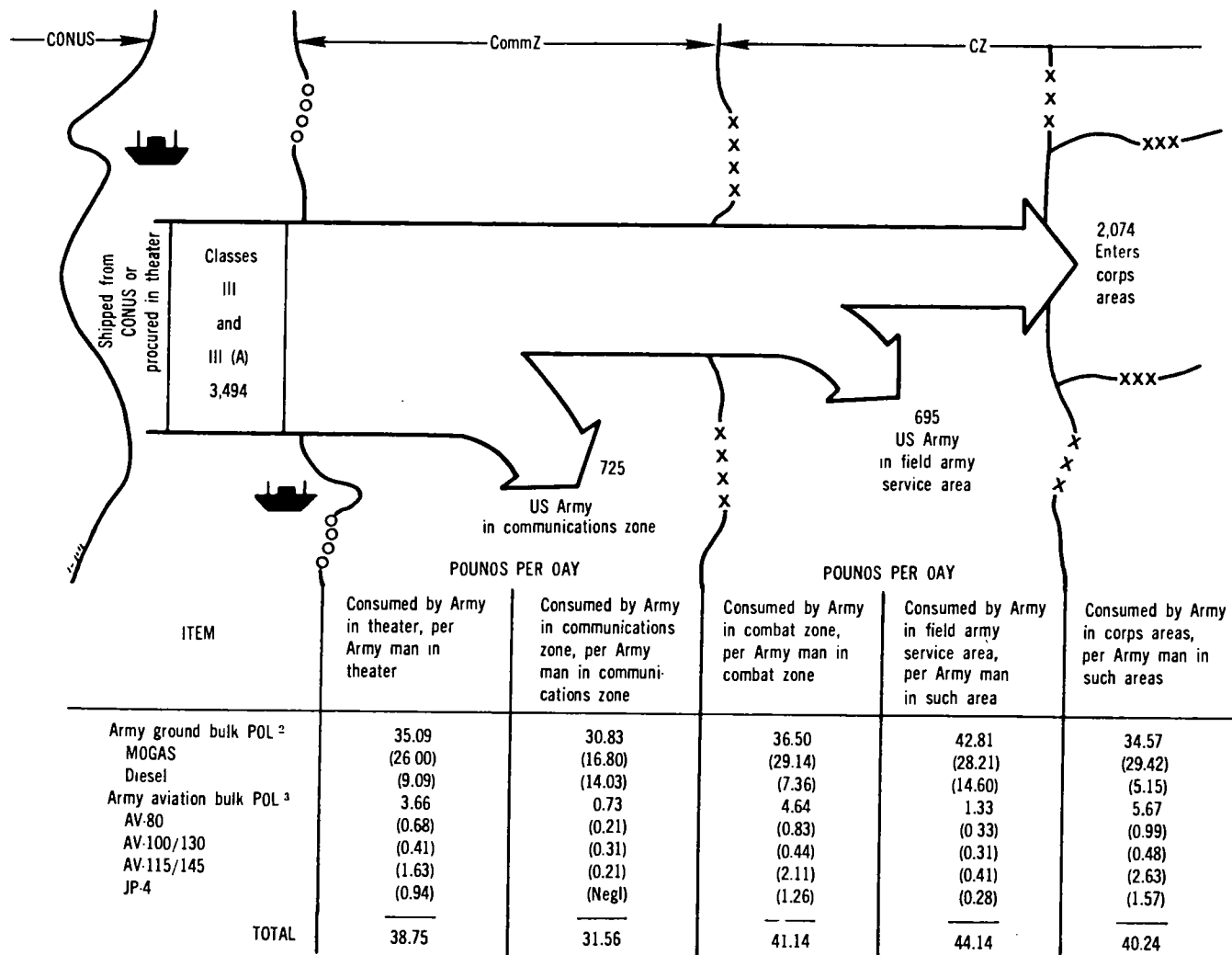


ITEM	POUNDS PER DAY				POUNDS PER DAY		
	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater, per Army man in theater	Consumed by Air Force in theater, per Air Force man in theater ¹	Consumed by Army in communications zone, per Army man in communications zone	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in field army and corps rear areas, per Army man in such areas	Consumed by Army in division areas, per Army man in such areas
Bulk POL (avn)	17.12	Negl	70.0	Negl	Negl	Negl	Negl
Bulk POL	13.70	11.95	19.1	² 19.0	² 9.62	² 17.0	² 5.0
Solid fuel	9.20	8.94	10.0	22.0	4.62	12.0	Negl
Packaged POL	(²)	(²)	(²)	(²)	(²)	(²)	(²)
TOTAL	40.02	20.89	99.1	41.0	14.24	29.0	5.0

¹ Includes Army troops required within the theater because of the presence of Air Force elements, which are provided Army administrative support.

² Because of the variety of means of distribution, bulk and packaged POL cannot be segregated in this table.

(2) *Short tons per corps slice per day—Classes III and III (A) (based on assumed mileages and flight times for POL.)*¹

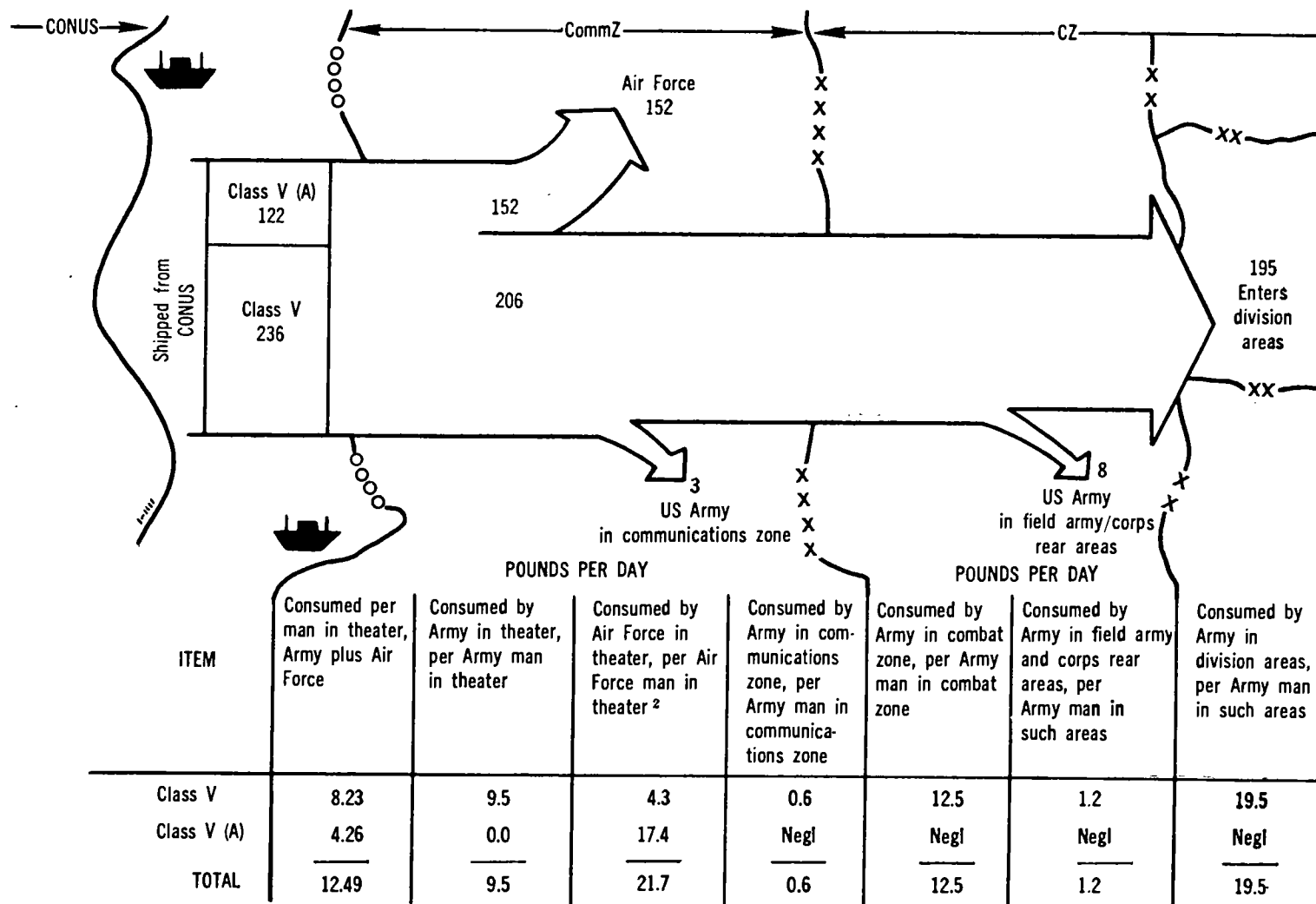


¹ Consumption factors may be adjusted upward or downward to satisfy revised assumptions pertaining to mileage or flight time.

² Based on an assumed mileage of 50 miles per day for all vehicles.

³ Based on 4 hours' flying time per day for all aircraft.

f. Short Tons Per Division Slice Per Day—Classes V and V (A)¹ (based on World War II and Korean experience data).



¹ Nongas conditions.

² Includes Army troops required within the theater because of the presence of Air Force elements, which are provided Army administrative support.

5.50. European Theater*

1	2	3	4	5	6
Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
Class I—rations.....	7.170	0.108	2.1	0.227	0.261
Class II:					
3 QM clothing and equipage.....	0.426	0.006	2.0	0.012	0.014
4 QM general supplies.....	0.305	0.005	2.8	0.014	0.016
5 Ordnance vehicle replacement.....	0.620	0.009	2.2	0.020	0.023
6 Engineer.....	0.630	0.009	3.3	0.030	0.035
7 Ordnance.....	2.710	0.041	1.8	0.074	0.085
8 Chemical.....	0.025	0.001	2.3	0.002	0.002
9 Signal (includes class IV).....	0.725	0.011	3.8	0.042	0.048
10 Medical (includes class IV).....	0.300	0.005	2.5	0.013	0.015
11 Total class II.....	5.741	0.087		0.207	0.238
Class III:					
Bulk: ²					
12 Motor gasoline.....	9.100	0.137	1.5	0.206	0.237
13 Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14 Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15 Heating fuel.....	6.500	0.098	1.5	0.147	0.169
16 Subtotal.....	17.660	0.266		0.400	0.460
Packaged: ³					
17 Motor gasoline ⁴	0.600	0.009	1.5	0.014	0.016
18 Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
19 Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20 Heating fuel ⁴	0.430	0.006	1.5	0.009	0.010
21 Engine oil.....	0.300	0.005	1.5	0.008	0.009
22 Gear lubricant.....	0.060	0.001	1.5	0.002	0.002
23 Greases.....	0.030	Negl	1.5	Negl	Negl
24 Army aviation greases and lubricants.....	0.020	Negl	1.5	Negl	Negl
25 Other.....	0.150	0.002	1.5	0.003	0.003
26 Subtotal.....	1.710	0.025		0.040	0.044
27 Total class III.....	19.370	0.291		0.440	0.504
Class IV:					
28 Medical (included in class II).....					
29 Ordnance motor maintenance.....	0.510	0.008	1.0	0.008	0.009
30 QM sales items.....	2.000	0.030	1.7	0.051	0.059
31 AF supply and replacement.....	2.840	0.043	4.0	0.172	0.198
32 Engineer construction material.....	7.280	0.109	1.5	0.164	0.189
33 Signal (included in class II).....					
34 Chemical.....	Negl				
35 Transportation.....	0.140	0.002	2.4	0.005	0.006
36 Total class IV.....	12.770	0.192		0.400	0.461

*Nongas condition; based on World War II and Korean experience data.
See footnotes at end of table.

	1	2	3	4	5	6
	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
37	Class V:					
38	Ammunition (less AF).....	3.640	0.055	0.9	0.050	0.058
39	AF ammunition.....	4.410	0.066	0.9	0.059	0.068
40	Total class V.....	8.050	0.121		0.109	0.126
	Total, European Theater.....	53.101	0.799		1.383	1.590

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5.51. Pacific Theater*

	1	2	3	4	5	6
	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
2	Class I—rations.....	6.710	0.101	2.1	0.212	0.244
3	Class II:					
4	QM clothing and equipage.....	1.000	0.015	2.0	0.030	0.035
5	QM general supplies.....	0.730	0.011	2.8	0.031	0.036
6	Ordnance vehicle replacement.....	0.620	0.009	2.2	0.020	0.023
7	Engineer.....	0.370	0.006	3.3	0.020	0.023
8	Ordnance.....	0.300	0.005	1.8	0.009	0.010
9	Chemical (includes class IV).....	0.567	0.009	2.3	0.021	0.024
10	Signal (includes class IV).....	0.750	0.011	3.8	0.042	0.048
11	Medical (includes class IV).....	0.333	0.005	2.5	0.013	0.015
	Total class II.....	4.670	0.071		0.186	0.214
	Class III:					
	Bulk: ²					
12	Motor gasoline.....	5.000	0.075	1.5	0.113	0.130
13	Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14	Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15	Heating fuel.....	5.700	0.086	1.5	0.129	0.148
16	Subtotal.....	12.760	0.192		0.289	0.332
	Packaged: ³					
17	Motor gasoline ⁴	0.250	0.004	1.5	0.006	0.007
18	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
19	Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20	Heating fuel ⁴	0.370	0.006	1.5	0.009	0.010

* Nongas conditions; based on World War II and Korean experience data.
See footnotes at end of table.

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	1	2	3	4	5	6
	Item	Pounds per man per day	Tons man per per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
	Class III—Continued					
	Packaged ³ —Continued					
21	Engine oil.....	0.300	0.005	1.5	0.008	0.009
22	Gear lubricant.....	0.060	0.001	1.5	0.002	0.002
23	Greases.....	0.030	Negl	1.5	Negl	Negl
24	Army aviation greases and lubricants.....	0.030	Negl	1.5	Negl	Negl
25	Other.....	0.150	0.002	1.5	0.003	0.003
26	Subtotal.....	1.310	0.020		0.032	0.035
27	Total class III.....	14.070	0.212		0.321	0.367
	Class IV:					
28	Medical (included in class II).....					
29	Ordnance motor maintenance.....	0.180	0.003	1.0	0.003	0.003
30	QM salcs items.....	1.970	0.030	1.7	0.051	0.059
31	AF supply and replacement.....	2.840	0.043	4.0	0.172	0.198
32	Engineer construction material.....	11.900	0.179	1.5	0.268	0.308
33	Signal (included in class II).....					
34	Chemical (included in class II).....					
35	Transportation.....	0.130	0.002	2.4	0.005	0.006
36	Total class IV.....	17.020	0.257		0.499	0.574
	Class V:					
37	Ammunition (less AF).....	5.140	0.077	0.9	0.070	0.081
38	AF ammunition.....	3.470	0.052	0.9	0.047	0.054
39	Total class V.....	8.610	0.129		0.117	0.135
40	Total, Pacific Theater.....	51.080	0.770		1.335	1.534

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5.52. Far East Theater*

Data on classes I, II and IV, and V are not available at time of publication.

	1	2	3	4	5	6
	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
	Class III:					
	Bulk: ²					
2	Motor gasoline.....	8.600	0.129	1.5	0.194	0.223
3	Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
4	Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
5	Heating fuel.....	9.300	0.140	1.5	0.210	0.242
	Subtotal.....	19.960	0.300	-----	0.451	0.519
	Packaged: ³					
6	Motor gasoline ⁴	0.500	0.008	1.5	0.012	0.014
7	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
8	Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
9	Heating fuel ⁴	0.610	0.009	1.5	0.014	0.016
10	Engine oil.....	0.400	0.006	1.5	0.009	0.010
11	Gear lubricant.....	0.100	0.002	1.5	0.003	0.003
12	Greases.....	0.040	0.001	1.5	0.002	0.002
13	Army aviation greases and lubricants.....	0.020	Negl	1.5	Negl	Negl
14	Other.....	0.150	0.002	1.5	0.003	0.003
15	Subtotal.....	1.940	0.030	-----	0.047	0.052
16	Total class III.....	21.900	0.330	-----	0.498	0.571

¹ Conversion factors are based on average cubage for each item. Measurement ton (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor

² Represents 95 percent of total theater daily consumption factor.

³ Includes weight of product and packing.

⁴ Represents 5 percent of total theater daily consumption factor.

5.53. Polar Regions

Note. Estimated, based on arctic test operations.

	1	2	3	4	5	6
	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
2	Class I—rations.....	10.400	0.156	2.1	0.328	0.377
	Class II:					
3	QM clothing and equipage.....	0.850	0.013	2.9	0.038	0.044
4	QM general supplies.....	0.400	0.006	2.8	0.017	0.020
5	Ordnance vehicle replacement.....	0.620	0.009	2.2	0.020	0.023
6	Engineer.....	0.840	0.013	3.3	0.043	0.049

* Nongas conditions; based on World War II and Korean experience data.
See footnotes at end of table.

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	1	2	3	4	5	6
	Item	Pounds per man per day	Tons per man per month	Conversion factor short tons to measurement tons ¹	Measurement tons per man per month	Measurement tons per man per month with 15% stowage
	Class II—Continued					
7	Ordnance.....	2.000	0.030	1.8	0.054	0.062
8	Chemical (includes class IV).....	0.030	Negl	2.3	0.001	0.001
9	Signal (includes class IV).....	0.660	0.010	3.8	0.038	0.044
10	Medical (includes class IV).....	0.400	0.006	2.5	0.015	0.017
11	Total class II.....	5.800	0.087	-----	0.226	0.260
	Class III:					
	Bulk: ²					
12	Motor gasoline.....	10.890	0.163	1.5	0.245	0.282
13	Diesel fuel.....	1.420	0.021	1.5	0.032	0.037
14	Army aviation gasoline.....	0.640	0.010	1.5	0.015	0.017
15	Heating fuel.....	17.100	0.257	1.5	0.386	0.444
16	Subtotal.....	30.050	0.451	-----	0.678	0.780
	Packaged: ³					
17	Motor gasoline ⁴	0.710	0.011	1.5	0.017	0.020
18	Diesel fuel ⁴	0.080	0.001	1.5	0.002	0.002
19	Army aviation gasoline.....	0.040	0.001	1.5	0.002	0.002
20	Heating fuel ⁴	0.900	0.014	1.5	0.021	0.024
21	Engine oil.....	0.800	0.012	1.5	0.018	0.021
22	Gear lubricant.....	0.200	0.003	1.5	0.005	0.006
23	Greases.....	0.050	0.001	1.5	0.002	0.002
24	Army aviation greases and lubricants.....	0.020	Negl	1.5	Negl	Negl
25	Other.....	0.150	0.002	1.5	0.003	0.003
26	Subtotal.....	2.950	0.045	-----	0.070	0.080
27	Total class III.....	33.000	0.496	-----	0.748	0.860
	Class IV:					
28	Medical (included in class II).....					
29	Ordnance motor maintenance.....	0.500	0.008	1.0	0.008	0.009
30	QM sales items.....	2.000	0.030	1.7	0.051	0.059
31	AF supply and replacement ⁵	3.500	0.052	4.0	0.208	0.239
32	Engineer construction material.....	12.000	0.180	1.5	0.270	0.310
33	Signal (included in class II).....					
34	Chemical (included in class II).....					
35	Transportation.....	0.140	0.002	2.4	0.005	0.006
36	Total class IV.....	18.140	0.272	-----	0.542	0.623
	Class V:					
37	Ammunition.....	1.800	0.027	0.9	0.024	0.028
38	AF ammunition ⁶	3.500	0.052	0.9	0.047	0.054
39	Total class V.....	5.300	0.079	-----	0.071	0.082
40	Total.....	72.640	1.090	-----	1.915	2.202

¹ Conversion factors are based on average cubage for each item. Measurement (40 cu ft) of any one item can be found by multiplying its short ton (2,000 lb) weight by that item's conversion factor.

- ¹ Represents 95 percent of total theater daily consumption factor.
² Includes weight of product and packing.
³ Represents 5 percent of total theater daily consumption factor.
⁴ Classes II (A) and IV (A).
⁵ Class V (A).

5.54. Combat Zone and Communications Zone

1	Item	Pounds per man per day		
		2	3	4
		Per Army man in combat zone, continental land mass ¹	Per Army man in combat zone, jungle ²	Per Army man in communications zone ³
2	Class I.....	7.690	5.950	8.800
3	Classes II and IV:			
4	Air.....	0.023	0.016	Negl
5	Cml.....	0.040	0.090	0.030
6	Engr.....	2.490	8.950	13.200
7	Med.....	0.112	0.560	1.110
8	Ord.....	4.950	0.860	3.000
9	QM.....	0.928	1.350	0.750
10	Sig.....	0.973	0.346	0.630
11	Trans.....	0.110	Negl	6.000
12	Total II and IV.....	9.630	12.200	24.700
13	Class III.....	12.000	7.530	41.000
14	Class V.....	13.400	8.680	1.400
15	Total.....	43.200	34.400	75.900

¹Based on operations in Europe, all armies, 21 February 1945 to 28 March 1945

²Based on Sixth and Eighth Army operations, December 1943 to September 1914.

³Assumed from theater averages, World War II

5.55. Field Army and Corps in Combat (Continental Land Mass)

1	Item	Short tons per day	
		2	3
		Per field army ¹	Per corps ²
2	Class I.....	1,508.0	356.0
3	Classes II and IV:		
4	Air.....	4.5	1.6
5	Cml.....	7.8	1.8
6	Engr.....	488.0	115.0
7	Med.....	21.9	5.2
8	Ord.....	970.0	229.0

1	Item	Short tons per day	
		2	3
		Per field army ¹	Per corps ²
8	QM.....	181.0	42.9
9	Sig.....	191.0	45.0
10	Trans.....	21.6	5.0
11	Total II and IV.....	1,886.0	445.0
12	Class III.....	2,350.0	555.0
13	Class V ³	2,630.0	620.0
14	Total.....	8,374.0	1,975.0

¹Computed for field army of 3 corps, each corps composed of 3 infantry divisions and 1 armored division, and including necessary supporting and service elements (total strength 392,000)

²Computed for corps of 3 infantry divisions and 1 armored division, with necessary supporting and service elements (total strength 92,500)

³Class V data applicable for periods of 14 days or more.

5.56. Airborne Division in Airborne Assault^{1 2}

1	Item	Short tons per division per day	
		2	3
		Pounds per man per day	Short tons per division per day
2	Class I.....	6.60	34.89
3	Classes II and IV:		
4	Cml.....	0.00	0.00
5	Engr.....	1.00	5.29
6	Med.....	0.42	2.22
7	Ord.....	1.50	7.93
8	QM.....	1.00	5.29
9	Sig.....	1.04	5.50
10	Trans (avn) ³		
11	Total II and IV.....	4.96	26.23
12	Classes III and III (A):		
13	Class III ⁴	5.84	30.86
14	Class III (A) ⁵	4.63	24.50
15	Total III and III (A).....	10.47	55.36
16	Class V ⁶	86.06	454.93
17	Total abn div.....	108.09	571.41

¹Based on combined strength of assault echelon and followup echelon (total 10,572) of TOE 57D plus augmentations and attachments as set forth in FM 57-100, appendix VI, section II.

²Nongas conditions: based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

³Experience factors are not available

⁴Includes 5,000 gal per day for vehicles in objective area.

⁵Based on average of 4 hours' flying time per organic aircraft per day.

⁶Computed as one-half of basic load

5.57. Armored Division¹

	1	2	3	4	5	6	7	8	9
1	Item	Attack		Pursuit and exploitation		Defense		Reserve	
		Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
2	Class I.....	6.00	43.80	6.00	43.80	6.00	43.80	6.00	43.80
	Classes II and IV:								
3	Cml.....	0.25	1.80	0.25	1.80	0.25	1.80	0.25	1.80
4	Engr.....	0.70	5.10	0.54	3.90	0.42	3.10	0.21	1.80
5	Med.....	0.30	2.20	0.30	2.20	0.15	1.10	0.15	1.10
6	Ord.....	² 14.10	103.00	2.14	15.60	2.00	14.60	³ 2.50	18.30
7	QM.....	2.11	15.40	2.11	15.40	2.11	15.40	³ 2.25	16.40
8	Sig.....	0.87	6.40	0.85	6.20	0.37	2.70	0.37	2.70
9	Trans.....	0.12	0.88	0.12	0.88	0.12	0.88	0.12	0.88
10	Total II and IV.....	18.45	134.78	6.31	45.98	5.42	39.58	5.85	42.98
11	Class III ⁴	13.80	101.00	23.30	170.00	7.51	55.00	5.83	43.00
12	Class V.....	50.00	365.00	8.80	64.00	53.20	387.00	(⁵)	-----
13	Total armd div.....	88.25	644.58	44.41	323.78	72.13	525.38	17.68	129.78

¹ Nongas conditions; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

² Primarily battle losses of combat vehicles

³ Increase over inactive situation because of intensified maintenance and replacement activities

⁴ Does not include class III (A).

⁵ All elements of division out of combat

5.58. Infantry Division

a. Offensive Operations.¹

1	2	3	4	5	6	7	8	9	10	11
Item	Attack of fortified position		Attack of deliberately organized position		Attack of hastily organized position		Pursuit		Assault of hostile shore	
	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
Class I.....	6.000	41.25	6.000	41.25	6.000	41.25	6.000	41.25	6.900	47.40
Classes II and IV:										
Cml.....	0.251	1.70	0.252	1.70	0.051	0.40	0.091	0.60	0.191	1.30
Engr.....	2.130	14.60	0.843	5.80	1.260	8.70	0.979	6.70	1.170	7.80
Med.....	0.301	2.10	0.301	2.60	0.125	0.90	0.111	0.80	0.221	1.50
Ord.....	1.670	11.50	1.670	11.50	2.830	19.50	2.080	14.30	0.769	5.30
QM.....	0.942	6.50	0.929	6.40	0.938	6.60	0.659	4.50	0.502	3.50
Sig.....	0.959	6.60	0.991	6.80	0.961	6.60	0.710	4.80	0.389	2.70
Trans.....	0.110	0.96	0.110	0.96	0.110	0.96	0.110	0.96	0.110	0.96
Total II and IV.....	6.363	43.96	5.096	35.76	6.275	43.66	4.740	32.66	3.352	23.06
Class III ²	4.930	34.00	7.920	54.00	8.470	58.00	15.300	106.00	4.560	32.00
Class V.....	47.800	329.00	44.400	305.00	42.800	294.00	7.700	53.00	43.300	298.00
Total inf div....	65.093	448.21	63.416	436.01	63.545	436.91	33.740	232.91	58.112	400.46

¹ Nongas warfare; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

² Does not include class III (A)

b. Defensive Operations.¹

	1	2	3	4	5	6	7	8	9
1	Item	Covering, security force, retirement or delaying action		Defense of position		Inactive situation		Reserve	
		Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day	Pounds per man per day	Short tons per division per day
2	Class I	6.000	41.25	6.000	41.25	6.000	41.25	6.000	41.25
3	Classes II and IV:								
4	Cml.....	0.361	2.50	0.361	2.50	0.251	1.70	0.251	1.70
5	Engr.....	0.811	5.60	1.460	10.30	0.501	3.40	0.159	1.10
6	Med.....	0.121	0.80	0.221	1.50	0.151	1.00	0.151	1.00
7	Ord.....	1.470	10.10	1.500	10.30	0.829	5.70	1.250	8.60
8	QM.....	1.320	9.10	1.100	7.60	2.110	14.50	2.110	13.10
9	Sig.....	0.721	5.00	0.989	6.60	0.479	3.30	0.479	3.30
10	Trans.....	0.110	0.96	0.110	0.96	0.110	0.96	0.110	0.96
10	Total II and IV	4.914	34.06	5.741	39.76	4.431	30.56	4.510	29.76
11	Class III ²	12.500	86.00	6.830	47.00	6.410	44.00	2.230	15.00
12	Class V.....	26.100	179.00	50.000	344.00	16.200	111.00	-----	-----
13	Total inf div	49.514	340.31	68.571	472.01	33.041	226.81	12.740	71.16

¹ Nongas warfare; based on World War II data, modified to reflect new organizations and strengths. Changed tactical concepts may further modify these data.

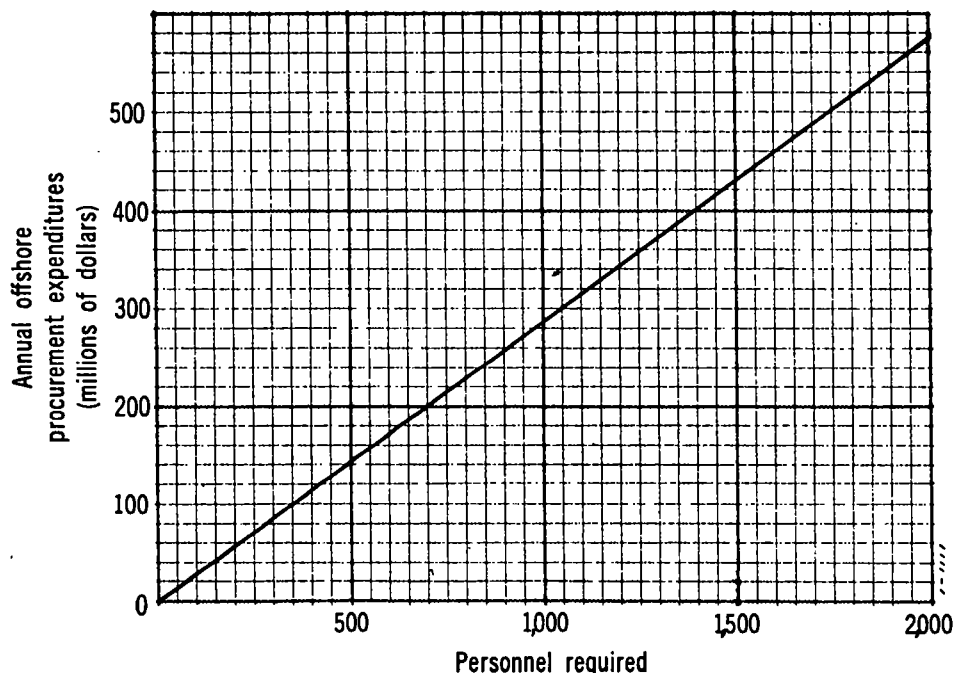
² Does not include class III (A).

Section VIII. PROCUREMENT

5.59. Procurement

a. Procurement Operations. Subsequent to World War II, the U.S. Army has been called upon to provide logistical support for Allied forces throughout the world in addition to fulfilling its own requirements. "Offshore" procurement agencies have been established in

Europe, the Middle East, and the Far East to supplement supplies which must be obtained from CONUS. Officers assigned to MAAG-type units may estimate the personnel required in a procurement section for the supplementary support of Allied forces by use of the following chart, which is applicable to all types of supplies:



b. Procurement Leadtime. Procurement leadtime may vary from 2 to 24 months. Because of the many variables involved, it is not possible to obtain an average estimate of leadtime with any degree of accuracy. Some of the factors

affecting leadtime are type of item, quantity to be procured, status of production base, and tooling involved. The appropriate technical service should be consulted on an item-by-item basis when a close estimate of leadtime is required.

Section IX. STORAGE

5.60. Definition of Terms

An understanding of the following terms is necessary to be able to use the data listed in this section in determining storage area requirements.

a. Storage space—Any space, without regard to type of construction or improvement, used for storage.

b. Storage building—Any building constructed or acquired for the storage of supplies, even though some part of it has been diverted to and is used for office, depot utility storage, or repair shops. Buildings constructed or acquired for office buildings, repair shops, depot utility storage buildings, except when they are used in whole or in part for the storage of supplies, are not considered storage buildings. The actual area used for storage purposes within such a building is considered storage space for reporting purposes.

- (1) *Warehouse space*—Area in a building designed for storage purposes and constructed with roof and complete side and end walls.
- (2) *Heated space*—Area in which the temperature may be controlled within specified limits by the application of heat.
- (3) *Unheated space*—Area not equipped with heating facilities.
- (4) *Humidity controlled space*—Warehouse area equipped with humidity control equipment.
- (5) *Flammable space*—Warehouse area which has been designed for the storage of highly flammable material.
- (6) *Shed space*—Area in a building without complete side and end walls.
- (7) *Other space*—Any area assigned for storage operations, within a structure

designed for other than storage purposes. Dry tank space is included.

c. Gross space—The entire inside area of covered storage space, determined by using inside dimensions of building; the overall area of open storage space with no deductions for trackage and permanent roads; the actual storage space (pads) for open ammunition of toxic space.

d. Bin storage—Storage of parts, subassemblies, assemblies, or end items in bins so that an item may be withdrawn without breaking open a package containing a number of such items.

e. Aisle in storage space—Area designated for passageway within the storage area.

f. Receiving and shipping space—Gross space designated as work area for receipt and shipment of supplies and equipment.

g. Nonstorage space—That area within gross space which is not used for storage because of structural losses or designation for other than storage purposes. Includes transit shed space when used or reserved for that purpose.

h. Net storage space—The floor area upon which bins are erected plus the floor areas upon which material can be stored.

i. Net usable general storage space—That portion of total gross space on which supplies can actually be stored. It does not include bin storage space, aisles, or receiving and shipping space.

j. Open space—Improved or unimproved area designated for use in storing material.

k. Open improved storage space—Open area which has been graded and hard surfaced or prepared with topping of some suitable material to permit effective materials handling operations.

l. Open unimproved wet space—That water area specifically allotted to and usable for the storage of floating equipment.

m. Magazine (including "igloo")—Storage structures above or below ground, constructed for the storage of ammunition and explosives. These structures will be reported as magazines regardless of whether ammunition and explosives are actually stored in them. The only cir-

cumstances under which magazines will be reported under warehouse space are when the magazine has been designated as "flammable material space" in accordance with definition heretofore. Conversely, warehouses containing ammunition will not be reported as magazines. Occupancy of magazine will be computed to include that area utilized as access aisle space contiguous to materials stored. The remainder unoccupied will be reported as vacant.

n. Tank storage space—Space in tank designated for the storage of supplies other than bulk liquids.

o. Ammunition and toxic open space—Area especially prepared for storage of explosive ammunition and toxic materiel. For reporting purposes, it does not include the surrounding area restricted for storage because of safety-distance factors. It includes barricades and improvised coverings.

p. Cold storage warehouse—Space in which a controlled temperature below 50° F. may be maintained.

- (1) *Chill space*—Refrigerated warehouse area in which the temperature can be controlled between 32° F. and 52° F.
- (2) *Freeze space*—Refrigerated warehouse area in which the temperature can be controlled below a level of 32° F.

q. Allocated space—That area designated by higher authority representing the gross area formally apportioned for use. Space formally apportioned to the heads of administrative and technical services by the Deputy Chief of Staff for Logistics, Department of the Army.

r. Dispersed storage areas—Those portions of a depot or subinstallation that are geographically located away from the main establishment, but not at another reporting installation.

s. Subinstallations—Those establishments so designated by Department of the Army directives.

t. Site area.

- (1) Site area, in covered storage, is the total land area required for buildings, spaced at minimum distances, plus all the necessary operating areas, such as

access roads, depot roads, railway sidings, and truck parks.

- (2) Site area, in open storage, is the total land surface required for net usable general storage area as defined above, plus that additional area required to fulfill safety regulations and to properly operate the storage facility as a whole.

u. Gross space factor—The ratio of the gross space to the net usable general storage area. After the net usable general storage area requirement, as described above, has been determined, the gross space requirement is obtained

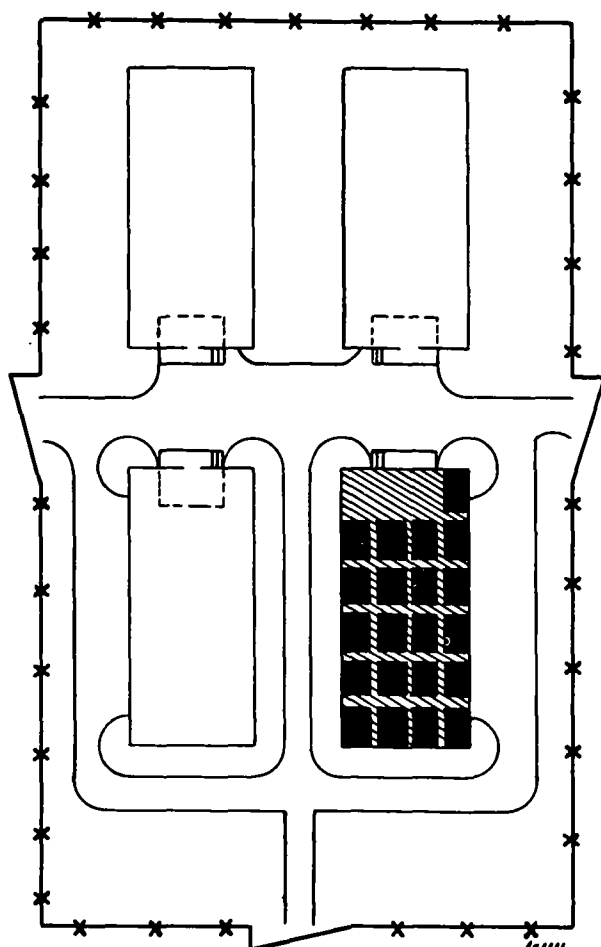
by multiplying the net usable general storage area value by the pertinent gross space factor, as follows:

$$\text{Gross space} = \text{Net usable general storage area} \times \text{Gross space factor.}$$

v. Site area factor—The ratio of the site area to gross space. These figures can be determined by the use of gross space and site area factors shown on chart, paragraph 5.64. Having determined the gross space requirements, the site area requirement is obtained by multiplying the gross space value by the pertinent site area factor as follows:

$$\text{Site area} = \text{Gross space} \times \text{Site area factor.}$$

w. Illustrating diagram.



LEGEND

-  = Net usable storage area.
-  +  = Gross space (in covered storage, this equals the total floor space of the buildings).
-  +  +  = Site area.

5.61. Storage Factors

a. The following table gives optimum storage tonnage area requirements for support of military operations. These data are for general

planning purposes only and may vary greatly as a result of climate conditions or the tactical situation. For detailed data pertaining to storage planning, see TM 743-200.

1	2	3	4	5	6	7	8
Class	Consumed per man in theater Army plus AF, short tons/man/month	Percentage of tons of supplies stored		Tons/man/month of supplies stored		Gross space/man/month of supply	
		Covered	Open	Covered (short tons)	Open (short tons)	Covered (sq ft)	Open (sq ft)
I.....	0.1005	60	40	0.0603	0.0402	0.910	0.803
II, IV, II (A), and IV (A):							
3 Air Force (II (A) and IV (A) less aircraft).....	0.0390	(Storage provided in air depot)					
4 Chemical.....	0.0009	70	30	0.0006	0.0003	0.014	0.009
Engineer:							
5 Less construction.....	0.0095	20	80	0.0019	0.0076	0.023	0.152
6 Construction.....	0.1092	10	90	0.0109	0.0983	0.125	1.875
7 Medical.....	0.0045	90	10	0.0040	0.0005	0.080	0.012
Ordnance:							
8 Less vehicles.....	0.0407	20	80	0.0081	0.0326	0.120	0.644
9 Vehicles.....	0.0102	0	100	0.0000	0.0102	0.000	0.276
10 Vehicle parts.....	0.0077	40	60	0.0031	0.0046	0.048	0.124
Quartermaster:							
11 Sales items.....	0.0110	90	10	0.0099	0.0110	0.133	0.030
12 Less sales.....	0.0041	90	10	0.0037	0.0004	0.050	0.011
13 Signal.....	0.0110	70	30	0.0077	0.0033	0.210	0.045
14 Transportation.....	0.0020	5	95	0.0001	0.0019	0.001	0.034
III and III (A):							
15 Bulk POL (avn).....	0.1380	(Tank farm)					
16 Bulk POL.....	0.1455	(Tank farm)					
17 Solid fuel.....	0.1320	0	100	0.0000	0.1320	0.000	2.640
18 Packaged POL.....	0.0135	10	90	0.0014	0.0121	0.021	0.327
V and V (A):							
19 V (including 10 percent of V (A)) ¹	0.1304	10	90	0.0130	0.1174	0.195	2.350
20 V (A).....	0.0527	(Storage provided in air depot)					
21 Total.....	0.9624			0.1203	0.4669	1.762	9.763
22 II, III (packaged), and IV.....	0.3248	33	67	0.1073	0.4669	1.567	4.763
23 III solid fuels.....	0.1320	0	100	0.0000	0.1320	0.000	2.640
24 V.....	0.1304	10	90	0.0130	0.1174	0.195	2.350

¹ Army supporting Air Force will store small arms ammunition which is estimated to be 10 percent of total

b. Average ratios of gross space open to covered, by classes of supply are as follows:

	Ratios of gross space open to covered	
All classes (except bulk POL)....	5.5	1
Classes I, II, III (packaged and solid), and IV.	4.7	1
Classes I, II, III (packaged), and IV.	3.0	1
Class V (including 10% of V (A)).	12.0	1

c. For classified data pertaining to storage of hazardous materials, see FM 101-10, part III, chapter 5, section III.

5.62. Storage Space Conversion Factors

The following table indicates the net usable general storage area (sq ft) occupied per short ton:

	1	2	3	4	5
	Branch	Type of storage			
1		Covered storage	Open storage	Igloo and magazine	Open storage ammunition
2	Adjutant General's Corps.....	10.0			
3	Army Medical Service.....	13.0	16.0		
4	Chemical Corps.....	12.5	20.8	7.0	11.0
5	Corps of Engineers.....	8.0	13.0		
6	Ordnance Corps.....	10.0	18.0	7.0	11.0
7	Quartermaster Corps.....	9.0	17.1		
8	Signal Corps.....	10.0	16.0		
9	Transportation Corps.....	7.0	12.0		

5.63. Average Stack Heights*

- a. Covered Storage. All service.....8 ft.
b. Open Storage. All services.....6 ft.

* Figures given are for use in theaters For CONUS storage, increase by 25 percent.

5.64. Gross Space and Site Area Factors

	1	2	3	4	5	6
	Class of supply	Services	Gross space factors ¹		Site area factors ²	
1			Covered	Open	Covered	Open
2	I.....	Quartermaster.....	1.40	1.50	2.00	1.50
3	II.....	All services.....	1.25	1.30	1.80	1.43
4		Ordnance.....	2.00	2.00	3.00	3.00
5		Quartermaster.....	1.40	1.50	2.00	1.50
6	III ³	Signal.....	2.00	2.20	1.80	1.43
7		Quartermaster.....	1.25	1.30	1.80	1.43
8		All services.....	1.25	1.30	1.80	1.43
9	IV.....	Ordnance.....	2.00	2.00	3.00	3.00
10		Quartermaster.....	1.40	1.50	2.00	1.50
11		Signal.....	2.00	2.20		
12	V.....	Ordnance and chemical.....	1.25	1.25	⁴ 112.00	(⁵)

¹ Apply additional factor of 3 for storage in combat zone

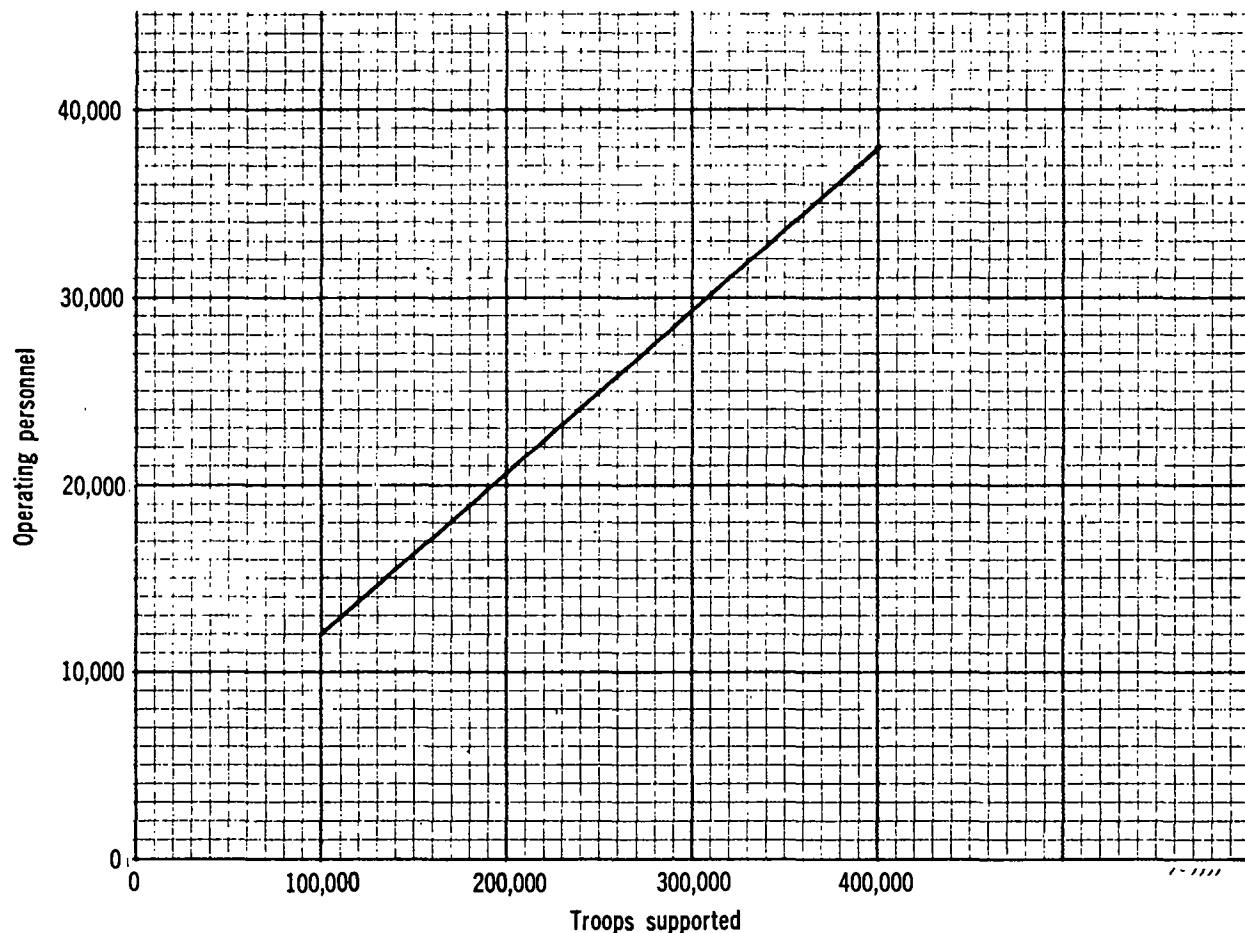
² Apply additional factor of 5 for storage of classes I, II, III, and IV in the combat zone.

³ Excludes bulk storage of petroleum in tanks

⁴ These factors take into consideration the great amount of dispersion necessary as a safety precaution in storing ammunition.

⁵ See paragraph 5.66.

5.65. Operating Personnel Required for All Storage Within a Theater*



* May include prisoners of war and civilians as available

5.66. Miscellaneous Factors¹

- Ammunition storage per mile of road²1,000 short tons.
- Ammunition storage per square mile²5,000 short tons.
- Minimum hardstanding requirements for 2,500 vehicles³ 110,000 sq ft.
- Solid footing for vehicle park for 2,500 vehicles4,000,000 sq ft.
- Minimum hardstanding requirement for artillery and combat vehicles, per item350 sq ft.

¹ Reference: ORD M 7-224.

² Refers to temporary storage of ammunition along roadways and in urban fields and forest, such as may be found in combat zones.

³ Data based on the assumption that hardstanding area will not be required for the total number of vehicles at any one time.

5.67. Handling of Supplies

a. Labor Requirements.

- (1) *Hand operations.* For long-term planning purposes, labor requirements for handling supplies by hand are computed on the average of 1/2 ton per man per hour for 10 hours each day. For short periods, the average is much higher.
- (2) *Mechanical handling.* For planning purposes, the labor requirements for handling supplies by use of mechanical equipment, such as forklift trucks and tractor-trailer trains, are normally limited to a working foreman and

equipment operators to operate the mechanical equipment necessary to efficiently handle these supplies.

b. Handling Crews.

(1) *Hand operations.* The maximum number of men that may be employed advantageously in loading or unloading one freight car is nine (one working foreman and eight laborers). The maximum crew for loading or unloading average loads by hand on Army trucks is five men (one working foreman and four laborers).

(2) *Mechanical handling of palletized loads.* The maximum number of men required to advantageously load or unload one freight car or truck of palletized supplies using mechanical handling equipment is three (one working foreman and two materials handling equipment operators).

c. Time Estimate (Based on Manual Han-

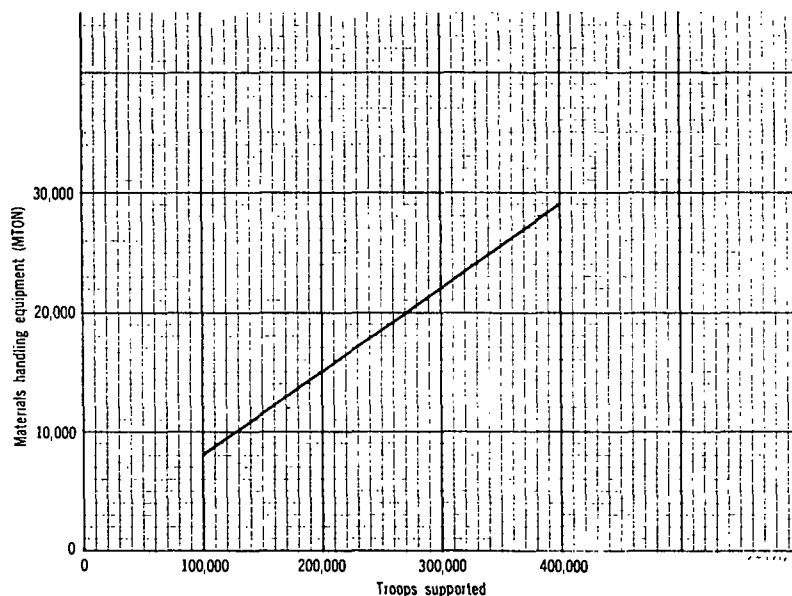
dling). The time estimate for average packaged or bundled military loads¹ at depots, supply points, or using units, under average conditions, a five-man crew for each truck or trailer, and the number of trucks or trailers to be loaded or unloaded simultaneously, dependent on amount of labor available, is as follows:

<i>Loading and unloading</i>	<i>2½-ton truck</i>	<i>1½-ton trailer</i>
Average time -----	50 min	20 min
Minimum time -----	30 min	12 min

5.68. Materials Handling Equipment Requirements

A depot supplying 100,000 men will require approximately 7,700 measurement tons of materials handling equipment, including conveyors, pallets, scales, tractors, trailers, forklift trucks, handtrucks, lumber-straddle trucks, stock-picker trucks, etc.

¹ See chapter 7 regarding authorized 100 percent overload for certain vehicles under some conditions and double time estimates when necessary.



5.69. Illustrative Problems

a. Situation, Problem A. To determine storage requirements for a theater of operations requiring 100,000 measurement tons of class I supplies.

b. Solution, Problem A. Storage area requirements:

A measurement ton (MTON) = 40 cu ft.
Therefore, 100,000 MTON × 40 =
4,000,000 cu ft of supplies to be stored.

Minimum percentage of covered storage required is 60 percent (par. 5.61).

Therefore, 40 percent open storage required.

$0.60 \times 4,000,000 \text{ cu ft} = 2,400,000 \text{ cu ft}$ of supplies requiring covered storage.

$0.40 \times 4,000,000 \text{ cu ft} = 1,600,000 \text{ cu ft}$ of supplies to be stored in the open.

Average stack heights (par. 5.62):

Covered storage = 8 feet.

Open storage = 6 feet.

$2,400,000 \text{ cu ft} \div 8 \text{ ft} = 300,000 \text{ sq ft}$, net usable area of covered storage required.

$1,600,000 \text{ cu ft} \div 6 \text{ ft} = 267,000 \text{ sq ft}$, net usable area of open storage required.

Gross space for each type of storage is based on net usable general storage areas.

Factors for computations, as found in paragraph 5.64, are—

Covered storage = 1.4

Open storage = 1.5

(Assume storage is to be in communications zone; hence, additional combat zone factor of 3 is not required.)

$300,000 \text{ sq ft} \times 1.4 = 420,000 \text{ sq ft}$, gross space required for covered storage.

$267,000 \text{ sq ft} \times 1.5 = 400,500 \text{ sq ft}$, gross space required for open storage.

Site areas for each type of storage are based on gross space. Factors for computations are found in paragraph 5.64.

Covered storage = 2.0

Open storage = 1.5

(Assume storage is to be in communications zone; hence, additional combat zone factor of 5 is not required.)

$420,000 \text{ sq ft} \times 2.0 = 840,000 \text{ sq ft}$, site area required for covered storage.

$400,500 \text{ sq ft} \times 1.5 = 600,750 \text{ sq ft}$, site area required for open storage.

Total site area required:

Covered storage = 840,000 sq ft

Open storage = 600,750 sq ft

1,440,750 sq ft

$1,440,750 \text{ sq ft} \div 43,560 \text{ sq ft (1 acre)} = 30.7$ or 31 acres of site area required.

c. *Situation, Problem B.* To determine operating personnel and materials handling equipment requirements for all storage in a theater which has a strength of 250,000 men.

d. *Solution, Problem B.*

(1) *Part I, operating personnel requirements.* (See graph, par. 5.65.) On the horizontal scale of this graph, locate the vertical line representing 250,000 men. This line crosses the oblique graph line at the horizontal line representing 24,500 operating personnel, as indicated on the left margin. Therefore, for general planning purposes, 24,500 men are needed to operate theater depots.

(2) *Part II, materials handling equipment requirements.* Using the same assumption for theater strength as used in part I above, the graph in paragraph 5.68 shows that for 250,000 men, 18,500 measurement tons of materials handling equipment will be required.

5.70. Characteristics of Materials Handling Equipment

	1	2	3	4	5	6	7	8	9	10	11	12
1	Item ¹	Dimensions			Weight (lb)		Dis- place- ment (cu ft)	Capacity		Type of tires ² (S—solid rubber) (P— pneu- matic)	Method of opera- tion	Primary use
		Length (in.)	Width (in.)	Height (in.) (mini- mun)	Operat- ing	Shipping		Load (lb)	Height			
2	Trucks, forklift.....	69	35	83	4,480	-----	119	2,000	10' 10"	S	Gasoline	Useful in moving and stacking palletized loads. Not efficient to move supplies over horizontal distances greater than 250 ft.
3	-----	65	35	83	3,700	-----	166	2,000	10' 10"	S	Electric	
4	-----	76	41	83	5,876	-----	150	3,000	9' 0"	S	Gasoline	
5	-----	115	79	107	7,035	-----	570	3,500	12' 0"	P	Gasoline	
6	-----	78	41	91	6,870	7,130	174	4,000	12' 0"	S	Gasoline	
7	-----	76	41	102	6,186	-----	184	4,000	12' 0"	S	Gasoline	
8	-----	105	45	95	7,660	-----	260	4,000	12' 0"	P	Gasoline	
9	-----	118	33	83	5,714	6,470	153	4,000	10' 10"	S	Electric	
10	-----	77	41	91	5,920	6,300	146	4,000	12' 0"	S	Electric	
11	-----	113	68	115	10,375	10,800	528	6,000	14' 0"	P	Gasoline	
12	-----	94	42	92	9,200	-----	210	6,000	10' 7"	S	Gasoline	
13	-----	94	42	113	9,400	-----	258	6,000	14' 0"	S	Gasoline	
14	-----	84	43	102	10,155	-----	212	6,000	14' 0"	S	Electric	
15	-----	136	77	150	14,145	-----	976	10,000	17' 6"	P	Gasoline	
16	-----	152	96	150	18,330	-----	1,267	15,000	17' 6"	P	Gasoline	
17	Trucks, forklift, rough terrain.	243	90	124	16,850	-----	1,550	6,000	12' 0"	P	Gasoline		Transfer of cargo on unimproved surfaces. Most common usage, beach operations.
18	-----	276	102	131	26,580	24,000	2,131	10,000	12' 0"	P	Gasoline	Primarily for transporting unit loads short distances. May be used for stacking. Less expensive than forklift trucks, but less maneuverable.
19	Trucks, platform	86	31	-----	-----	-----	-----	4,000	0' 4"	-----	Electric	
								Drawbar pull (lb)				
20	Tractors, warehouse.	87	41	64	2,900	2,910	134	2,000		S	Electric	Used for drag towing on skids or towing one or more trailers. Tractor is small and maneuverable; should be used for moving when distance exceeds 250 ft.
21	-----	93	42	62	3,260	3,260	144	2,600		P	Gasoline	
22	-----	111	66	57	5,220	-----	252	4,000		P	Gasoline	
23	-----	116	66	62	5,800	5,870	277	4,000		P	Gasoline	
24	-----	86	42	59	3,500	3,650	131	4,000		S	Electric	
25	-----	130	96	72	9,500	-----	520	7,500		P	Gasoline	
								Load (lb)				

26	Cranes, wheeled, swinging boom.	139	63	72	12,855	-----	365	6,000	S	Electric	Handles loads of shapes and size which are moved with difficulty by other equip- ment.
27	-----	295	94	95	20,800	20,800	1,525	10,000	P	Gasoline	
28	-----	273	96	260	20,000	20,320	1,441	10,000	P	Gasoline	
29	Trucks, straddle-----	192	96	159	14,800	16,500	1,733	30,000	P	Gasoline	Used extensively for moving lumber, poles, pipe, rods, and girders.

¹ All items of materials handling equipment not listed here. Typical items of varying capacities are listed. For more complete information, see TM 10-1619.

² Solid rubber-tired vehicles are used for hardstand; pneumatic-tired for unimproved terrain.

Section X. DISTRIBUTION

5.71. Routine Requisition and Shipping Times

The following table illustrates the times required to process routine bulk shipment of supplies. Days shown are for illustrative purposes only and represent an average of the probable minimum and maximum time intervals for processing a wide variety of items under varying conditions. Such intervals will increase or decrease depending on the length and complexity of the requisition, the class of supply, the distance of the theater from CONUS, availability of transport, the type of transportation and handling facilities employed, workload on the various installations, and other factors.

	Days	
	Min	Max
Consolidating inventories and preparation of requisition in theater.	5	15
Airmail time to port of embarkation.....	2	5
Port of embarkation edits and extracts requisition.	3	10
Mail time to depot in CONUS.....	5	5
Depot processes requisition and sets up shipment.	15	125
Transit time from depot to port of embarkation.	5	15
Port of embarkation loads and ships.....	10	15
Transit time from port of embarkation to theater.	10	60
Port of discharge unloads supplies and moves them to depots.	5	10
Total elapsed time from date requisition initiated until the supplies are available for issue in theater of operations.	260	160

¹Days shown assume that the supplies are carried in stock. Requisitions for supplies which require special procurement may increase this period by 6 to 12 months (par 5.59).

²Special or emergency requisitioning procedures, establishment of priorities, special handling procedures, and utilization of air transport may reduce this figure by half. Where supply is expedited by use of high-speed communication equipment, the figures will be reduced by responsible agencies.

5.72. Army Repair Parts Supply System

a. The Army supply system is based on selective stockage, single-line item requisitions, and electronic transmission and processing of supply data. Requisitions are processed through field army, theater army logistical command, and overseas supply agencies to CONUS supply sources by means of high-speed data transmission equipment (transceivers). When coupled with centralized stock control, high-speed data

processing equipment, and direct delivery of theater nonstocked items to forward supply points, the system offers substantial reduction in order and shipping times.

b. The system as applied to the supply of repair parts to USAREUR indicates the following time factors:

	Emergency (EDP)	Days Replenishment
Processing at theater level....	3	6
Processing at overseas supply agency.	1	4
Processing at CONUS supply source.	11	17
Shipment to overseas terminal..	11	24
Overseas distribution.....	7	9
Total.....	33	60

5.73. Buildup of Supply Levels

a. For estimation of requirements when it is desired to build up a certain level of supplies by a given date, at the same time adequately supplying present and future contemplated operations during the buildup period, the following formula is useful:

$$S = C \left(1 + \frac{L}{T} + W \right)$$

when—

S = shipping requirements during the buildup phase, expressed in pounds per day.

C = consumption (average) in pounds per day.

W = a wastage factor (percentage of total consumption expressed as a decimal). This factor is based on experience in the particular theater and normally ranges from 0 to 0.25.

L = the supply level to be attained, expressed in days of supply.

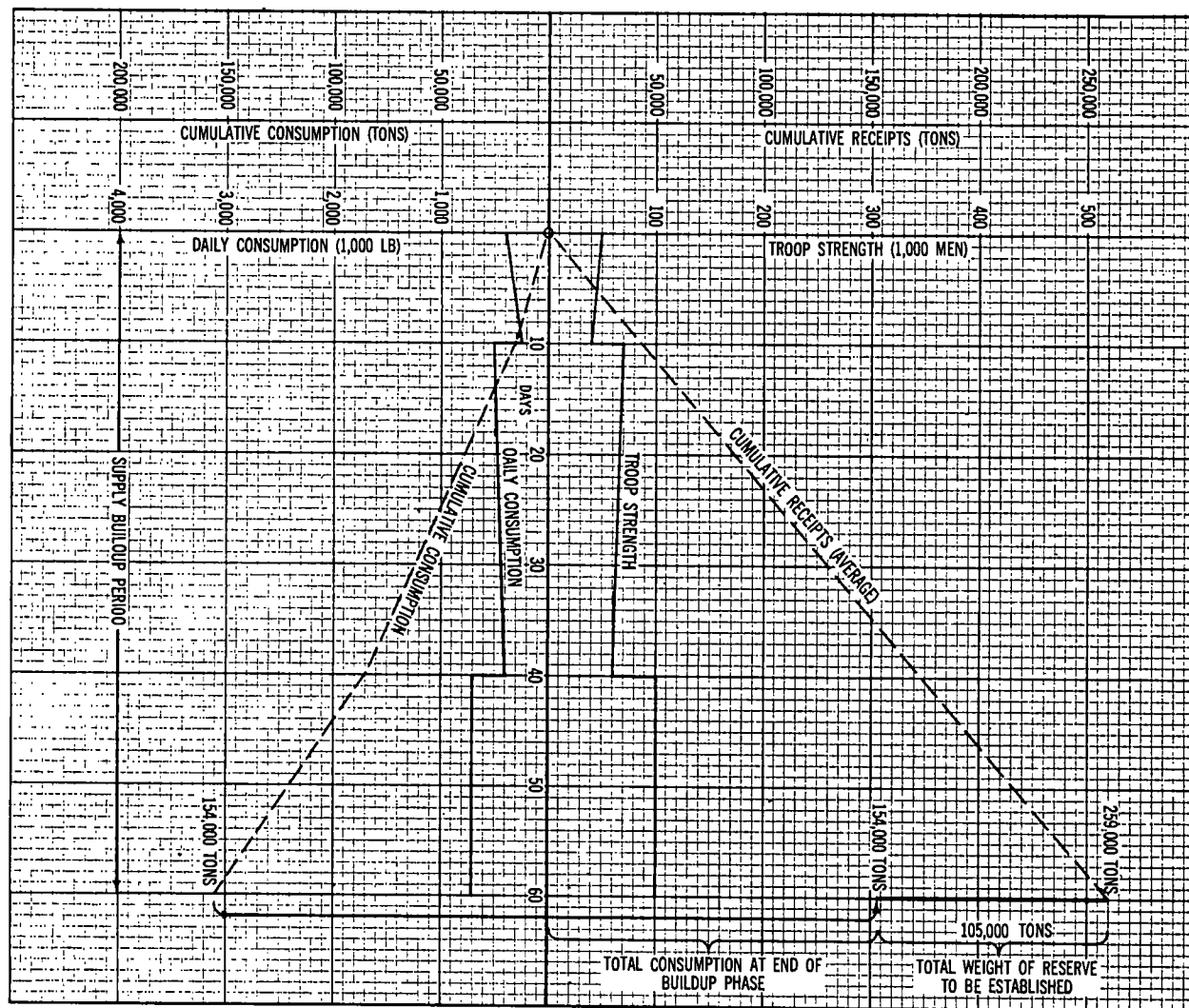
T = time in length of buildup phase in days.

(Given any four of the factors, the fifth can be determined by transposing.)

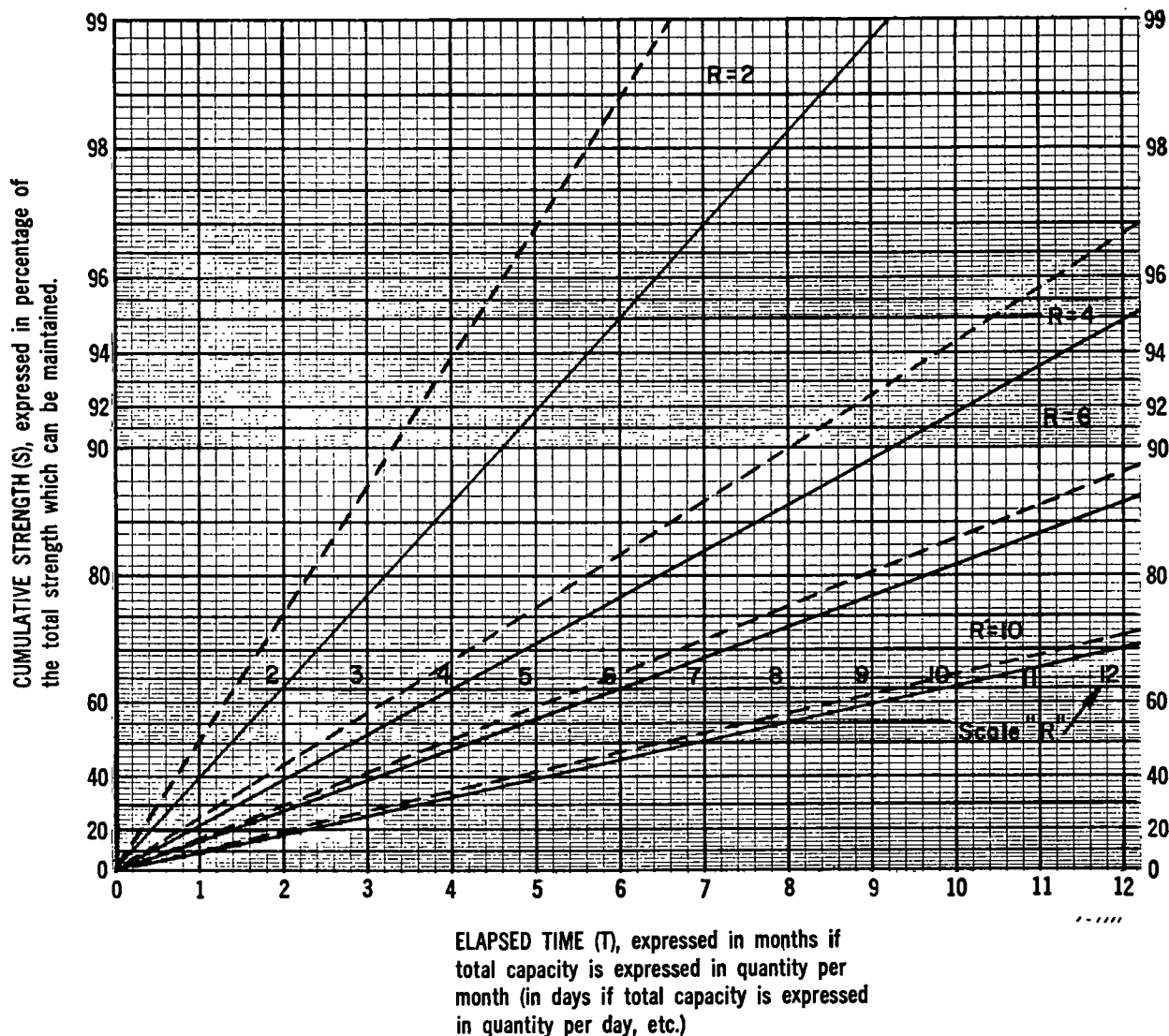
b. Since the formula in *a* above assumes a constant troop strength, a chart similar to the following may be used to show the relation be-

tween changes in troop strength, the cumulative consumption, and cumulative receipts in the

establishment of a specified level of supply during a given buildup period.



5.74. Lines of Communications Buildup Capacity



a. General.

- (1) The preceding chart indicates the maximum cumulative strength which can be built up in the shortest time, using lines of communications of fixed capacity, if these lines of communications also carry replenishment loads for personnel previously transmitted.
- (2) The chart is applicable to situations in which maintenance loads are directly proportional to loads previously carried (initial loads) and has been prepared for the values 2, 4, 6, and 10 of

R (ratio of initial to maintenance loads). Additional lines can be added readily to the chart for additional values of R .

- (3) For each value of R , two lines are shown on the chart—one solid and one dashed. For each value of R , use of the solid or dashed line in computations depends on the assumption applicable to the situation.
 - (a) The solid-line curve in each case is based on the assumption that at any time T , the strength being

served on a maintenance basis, is equal to the accumulation of strength previously served on an initial basis (that is, maintenance begins immediately upon passage, and initial loads are not alternately depleted and replenished).

- (b) The dashed-line curve in each case is based on the assumption that the increment of strength served on an initial basis in any 1 month will be served on a maintenance basis during the following month (that is, initial loads would be depleted, on the average, by approximately 15 days' maintenance supply before replenishment would begin).

b. Construction of Curves for Additional Values of R. To construct curves for values of *R*, other than those shown, proceed as follows:

- (1) For solid lines (see assumption in *a* (3) above), draw a straight line through the origin of (0, 0) and the point on scale *R* representing the value of *R* (ratio initial/maintenance loads).
- (2) For dashed lines (see assumption in *a* (3) above), draw a straight line through the origin (0, 0) and the point on scale *R* which is less by 0.5 than the value of *R*.

c. Examples of Use of Chart. This chart may be used in calculations relating to the movement of troops or supplies through a terminal or, analogously, to their movement over any available lines of communications—for example, a railroad, a highway, an air transport route. It can be used to determine the time it would take to reach various strengths, the strength which can be accumulated in any amount of time, and the necessary shiploads of initial or maintenance supplies. The ratio *R* may be based on space requirements; number of cars, ships, tonnages; number of individuals; etc.

(1) *Example 1.*

- (a) *Problem.* The capacity of a port = 300,000 MTON/month. Initial equipment for troops moving

through the port = 4.8 MTON/man; supplies for maintenance of troops moved through the port = 0.8 MTON/man/month. What strength can be built up through this port in 7 months if maintenance supply for the troops begins immediately with their passage?

(b) *Solution.*

1. $R = \text{initial} \div \text{maintenance load} = 4.8 \div 0.8 = 6.$
2. $T = \text{time elapsed} = 7 \text{ months}.$
3. From the chart, locate $T = 7$ on the horizontal scale, and continuing vertically upward to the intersection of $T = 7$ with the solid line for $R = 6$, read "Cumulative Strength (S)" from the vertical scale = 69 percent of the total strength which can be maintained.
4. Total strength which can be maintained = $300,000 \div 0.8 = 375,000$ troops.
5. Therefore, cumulative strength after 7 months = 69 percent of 375,000 = 259,000 troops.

(2) *Example 2.*

- (a) *Problem.* Assuming the same circumstances in example 1 above, how many new troops will be moved through the port during the 7th month?

(b) *Solution.*

1. Proceed as in the solution to example 1 above, except determine the cumulative strength after 6 months = 64 percent of the total strength which can be maintained.
2. From the solution to example 1 and the foregoing, it is observed that from the end of the 6th to the end of the 7th month (that is, during the 7th month), the cumulative strength changed from 64 to 69 percent of the total strength which could be maintained.

3. Therefore, the new troops moved in during the 7th month represent 69 less 64 percent = 5 percent of the total strength which can be maintained = 5 percent of 375,000 = 18,750 troops.

(3) *Example 3.*

(a) *Problem.* Assuming the circumstances as in example 1 above, except that the maintenance factor of 0.8 MTON/man/month is so established that maintenance can start during the following month for all troops moved initially during any 1 month, what could be the strength built up after 7 months?

(b) *Solution.*

1. Proceed as in the solution to example 1 above, except that in using the chart, use the *dashed* line for $R = 6$ rather than the solid line.
2. Read cumulative strength = 72 percent of the total strength which can be maintained.
3. Cumulative strength after 7 months = 72 percent of 375,000 = 270,000 troops.

(4) *Example 4.*

(a) *Problem.* Initial and maintenance supplies for service forces are to be moved over a highway, the capacity of which is 10,000 short tons per month. Initial equipment for these forces averages 3,350 pounds per man; maintenance averages 430 pounds per man per month. When will the size of the service force have been built up to 60 percent of its ultimate strength, if maintenance supply must begin immediately upon passage of the forces?

(b) *Solution.*

1. $S = 60$ percent of the maximum which can be supported.
2. $R = 3,350 \div 430 = 7.8$.
3. Inasmuch as no line for $R = 7.8$ appears on the chart, it must be

constructed. Observing the assumption in the problem above as to initiation of maintenance, draw a *solid* line through (0,0) and the point 7.8 on scale R (in accordance with directions above).

4. Using the constructed line, as indicated in previous examples, determine for $S = 60$ percent that $T = 7$ months.

5.75. Combat Zone Supply Installations

a. General.

- (1) Listed in the following chart are the field army supply installations usually found within the combat zone, showing in detail the class of supply for which each technical service is responsible and the normal supply installations for each class of supply. For each class of supply, the following are shown: the depots found in the field army service area; the supply points required to support the corps; and the normal procedure by which divisions or similar using units draw the specific classes of supply.
- (2) The supply system within the field army must be simple and, above all, flexible to meet changing situations. Mission, terrain, weather, road, and rail nets affect selection of locations for supply installations.
- (a) On the offensive, the supply points are well forward and contain at least 2 to 3 days of supply for the unit or units being served. As a general rule, two class I, class III, and class V supply points support each corps, located well forward in the area but out of heavy artillery range. Engineer class II and IV supply points might also be established if the conditions of roads and bridges require large quantities of construction materials. In addition to the medical depots, there nor-

mally will be three advance medical supply points, each supporting forward evacuation hospitals and divisions.

- (b) On the defensive, the engineer class II and IV supply points will be located well forward, containing fortification materials. The other supply points will be located farther to the rear and normally will carry 3 days' level for the troops supported.
- (c) Normally, transportation Army aircraft maintenance and supply companies will be located in the vicinity of an airstrip.

- (3) Supply points serve all units in the area. (If field army troops are located near a supply point, then that supply point will serve those units.) All field army supply points are operated by field army troops. All supply installations located in the corps or division area are cleared for area locations by corps or division before they are established.
- (4) The tables show the type of supply installations needed to support a field army under normal conditions. Ground reconnaissance is the only method for selecting sites for installations.

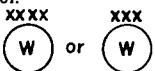
b. Installations.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
2 Chemical classes II and IV-----	1. Installation: chemical class II and IV depot. 2. Military symbol: XX XX 301  Dep 3. Two such depots normally in field army service area. 4. Wholesale issue to class II and IV supply points; retail to field army troops. 5. Operated by one or more chemical depot companies, depending on size of field army and on gas or nongas warfare conditions. 6. Levels established by theater. Will normally be 5 to 15 days.² 7. Covered storage required—approximately 80 percent. 8. Maintenance is furnished in or adjacent to this depot for chemical materiel by chemical maintenance companies.	1. Installation: chemical class II and IV supply point. 2. Military symbol: XX XX 303  SUPPT 3. When necessary. Normally one per corps operated by chemical depot company. 4. Normally retail issue. 5. Levels established by field army. 6. Covered storage required—approximately 50 percent. 7. Maintenance is furnished in or adjacent to this supply point by the maintenance supervision section of the chemical combat support platoon.	1. Battle groups and separate units will consolidate (when practicable) and submit requirements of subordinate elements to the attached chemical combat support platoon or the division chemical officer, depending on SOP. 2. The chemical combat support platoon or the division chemical officer submits requirements without consolidation direct to the supporting chemical depot in the field army service area. If supplies are regulated, requisitions are normally submitted through command channels or to the field army chemical officer for approval, based on field army or corps commander's priorities.³ 3. Field army normally delivers supplies to division trains areas, where supplies are broken down by the chemical combat support platoon or the division chemical officer. 4. Division continues unit distribution to divisional units. The chemical combat support platoon, when attached, is utilized for this purpose. 5. Corps troops submit requirements to the supporting chemical combat support platoon or the corps chemical officer, depending on SOP. Requirements are submitted without consolidation to the supply point supporting the corps or the chemical depot in the field army service area. 6. Field army normally delivers supplies to the chemical supply point supporting the corps. Corps troops will normally draw these supplies from the chemical supply point, when notified that supplies are ready for issue.
3 Chemical class V-----	1. Installation: chemical class V depot. 2. Military symbol: XXXX 302  Dep 3. One such depot normally established as part of each ordnance class V depot, with the ordnance class V military symbol. Depending on the field army commander's desire, it may be located in field army service area in proximity to the ordnance class V depot.	1. Installation: chemical class V supply point. 2. Military symbol: XXXX 304  SUPPT 3. Normally a part of or included in ordnance ASP. One or more of these supply points may be established in corps area, depending on needs of using troops located in proximity to the ordnance ASP. Depending on the field army commander's desire, it may be established as part of the ordnance ASP.	1. Battle groups and separate units will draw ammunition from the field army ASP supporting corps, based on ammunition requisition authenticated by division ammunition officer (DAO). Normally the quantity requested is to replenish the basic load. 2. Corps troops accomplish their own ammunition requisition, or equivalent, and draw requirements directly from ASP in corps area. 3. Corps controls the issue of class V chemical supplies to corps troops, if necessary. 4. Division, if necessary, controls the issue to subordinate units.

See footnotes at end of table.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
3 Chemical class V (continued) -----	4. Wholesale issue to ammunition supply points (ASP); retail to field army troops. 5. Operated by one or more chemical depot companies, depending on size of field army and on gas or nongas warfare conditions. 6. Levels established by theater. Normally 5 to 15 days of operation.² 7. Covered storage required—negligible. 8. When required, field army allocates class V supplies to corps. Copy of allocation to ASP. 9. Mixed flamethrower fuel is normally carried in class V depot. (When units do their own mixing, they draw gasoline from class III supply point serving them and draw napalm from chemical class V depot or ASP.)	4. Retail issue to corps and divisions. 5. Operated by a section of chemical company, combat support. 6. Levels established by field army; usually 2 to 3 days of operation. 7. When required, corps allocates class V chemical supplies to divisions and corps troops. 8. Supply point receives copies of field army and corps allocations. 9. See note 9 in column 2.	5. All ammunition issues to divisions are coordinated through DAO. 6. Division units will draw ammunition directly from field army supply points.
4 Engineer classes II and IV -----	1. Installation: engineer class II and IV depot. 2. Military symbol: XXXX 501  Dep 3. Normally one per field army located in field army service area. 4. Operated by engineer depot company (TOE S-267). 5. Level—5 to 15 days (5,000–20,000 tons).² Large quantities of construction materials, lumber, steel, and road material may be procured locally and not pass through the depot system. 6. Class II—issued on replacement or exchange basis on receipt of requisition approved by engineer supply officer of divisions and corps troops. Requests in excess of allowance require corps and field army engineer approval. 7. Class IV—issued on request of unit engineer supply officer. 8. Regulated items—see note 5, above.	1. Installation: engineer class II and IV supply point. 2. Military symbol: XXXX 511  SUPPT 3. Normally one per corps. Operated by engineer supply point company (TOE S-48). 4. Level—3 days (250–400 tons). Stockage generally consists of fortification or bridge materials. Corps bridge units may carry additional stocks of bridging materials. 5. Maintenance companies maintain small stocks of fast-moving items and issue first-, second-, and third-echelon parts for issue to the maintenance section of the infantry and armored division engineer battalions. Replenishment is from field army engineer depots.	1. A division engineer dump carrying limited quantities of selected items may be operated by the division engineer battalion. It is located either at the headquarters and headquarters company of the engineer battalion or is consolidated with other divisional services near the rear echelon. In any case, fortification and camouflage materials may be left in the infantry battle group areas, when desired. This latter method is more normal. 2. Class II—units requisition through division engineer. 3. Class IV—units request informally through division engineer. 4. Regulated items require approval of field army engineer before items can be drawn from field army depot or supply points, based on field army or corps commander's priorities.³ 5. Supplies are brought to the division area by field army. 6. Repair parts may be obtained through depot system or through supporting engineer maintenance company. 7. Repair parts sections of infantry and armored division engineer battalions maintain small stocks of fast-moving first-, second-, and third-echelon items obtained from supporting engineer field maintenance companies or depot system. Other units obtain repair parts through supporting engineer field maintenance companies.

See footnotes at end of table.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
4 Engineer classes II and IV (continued) - - - -	9. Maintenance companies maintain small stocks of fast-moving items and issue first-, second-, and third-echelon parts for issue to the maintenance section of the infantry and armored division engineer battalions. Replenishment is from field army engineer depots.		
5 Engineer water - - - - -	1. Military symbol:  2. Normally one per field army. 3. Production—540,000 gal—1 day. 4. Distribution—18,000-gal tank load. 5. Storage capacity—108,000 gal. 6. Used to supplement water sources of field army, corps, and division engineers, to transport water to units without a sufficient local source, and to transport water to installations which use large quantities of water and have inadequate means to transport it.	1. Installation: engineer water point. 2. Military symbol:  3. One to four points may be established by each corps and field army engineer battalion. 4. Maximum production, each battalion—120,000 gal. 5. Maximum storage, each battalion—12,000 gal. 6. Issue is made to all consumers who arrive at water point with empty containers. 7. Amphibious or airborne operations—water points of organic units can be in operation on D-day, 4 hours after arriving at source. Five days of supply often taken ashore in 5-gal cans and 55-gal drums and issued with class I supplies.	1. Installation: Division water point. 2. Military symbol:  3. One to five points may be established by the infantry division engineer battalion. 4. Production—150,000 gal—1 day. 5. Storage capacity—15,000 gal. 6. Issue is made to unit kitchen trucks and water trailers, which are sent to water points and transport water to unit kitchens.
6 Engineer maps - - - - -	1. Installation: engineer map depot. 2. Military symbol:  3. Normally one in field army service area located near field army headquarters. 4. Operated by map reproduction and distribution company. 5. Issues made to field army troops, corps, and divisions on basis of field army table of map allowances.	1. Normally one per corps. Operated by corps topographic company to supply division and corps troops. 2. Issues made to corps troops and divisions on basis of field army table of map allowances. 3. Maps obtained from corps topographic company and field army topographic battalion.	1. Division troops receive maps from division engineer battalion, which distributes maps under the staff supervision of division G2. 2. Division engineer obtains maps from the corps engineer. 3. Division usually requires two medium-scale maps, two large-scale maps, one road map, and one aeronautical chart.

See footnotes at end of table.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
6 Engineer maps (continued) -----	6. Normally one engineer topographic battalion performs new mapping by survey, photomapping, and reproduction, using photolithographic methods, with maximum sheet size of 22"x29". 7. Maps are obtained from field army topographic battalion and base map depots in communications zone.		
7 Medical classes II and IV -----	1. Installation: medical class II and IV depot. 2. Military symbol: XXXX 801  Dep 3. Normally one per field army located in field army service area. 4. Operated by field army medical depot (TOE 8-667). 5. Field army level—5 to 15 days.² 6. Depot restocks advance supply points and makes retail issues to units located in field army service area. 7. Regulated items require approval of the field army surgeon, based on field army commander's priorities.³ 8. Ninety percent of supplies require covered storage.	1. Installation: medical class II and IV supply point. 2. Military symbol: XXXX 851  SUPPT 3. Located within easy reach of evacuation and mobile army surgical hospitals. 4. Normally there will be one advance supply point supporting each corps with the primary mission of making bulk issues to division and retail issues to other units and hospitals. 5. Level—2 to 3 days.	1. Division medical battalion consolidates the requirements of the units of the division and draws in bulk from the nearest medical supply point. 2. Field army makes unit distribution to divisions, and unit distribution continues within the division normally through medical channels. 3. Field army medical units draw direct from nearest medical supply point.
8 Medical laboratory -----	1. Installation: medical laboratory. 2. Military symbol: XXXX  5802 Lab 3. Located in field army service area. 4. Carries a stock of laboratory supplies for field army medical units.		Field army medical units draw <i>laboratory supplies</i> from field army medical laboratory located in field army service area.

See footnotes at end of table.

1 Item	2 Field army service area	3 Corps area	4 Unit supply procedure ¹
9 Ordnance classes II and IV (less vehicles and artillery).	1. Installation: ordnance class II and IV depot. 2. Military symbol: XXXX 901  Dep 3. Normally two or more located in the field army service area and/or corps rear areas. 4. Operated by one or more ordnance field supply companies (TOE 9-57). 5. Issues to field army ordnance direct and general support units and division ordnance units. Transportation normally by field army TC units. 6. Stockage objective—normally 45 days (30 days' operating level and 15 days' safety level). May be modified by major commander.	1. Field army ordnance direct support units and division ordnance units maintain stocks of selected fast-moving items. Using unit is provided supply and maintenance support by the same ordnance unit. 2. Issues to using units. Transportation by field army TC or ordnance units, division TC or ordnance units, or unit transportation. 3. Stockage objective—normally 30 days (20 days' operating level and 10 days' safety level). May be modified by major commander.	1. Division units submit requirements to division ordnance unit. Other units submit requirements to supporting field army ordnance direct support unit. 2. Nonregulated items issued on requisition or direct exchange of serviceable items for unserviceable items. 3. Regulated items issued on requisition within allocation by division, corps, or field army. ³ 4. Division ordnance units and field army ordnance direct support units draw supplies in bulk from ordnance class II and IV depot to maintain stocks.
10 Ordnance classes II and IV (vehicles and artillery only).	1. Installation: ordnance park. 2. Military symbol: XXXX 903  Park 3. Normally one or more in the field army service area. 4. Operated by ordnance park company (TOE 9-137), augmented by ordnance direct support and general support units as required. 5. Issues to field army ordnance direct and general support units and division ordnance units. Transportation normally by ordnance park company or field army TC units. 6. Stockage objective is based on a percentage of density of each type of vehicle and artillery end item in the field army plus demand data as outlined in DA SB 9-101 and 9-107. Part of this level may be located in field army maintenance and supply units.	1. Field army ordnance direct support units and division ordnance units receive and issue vehicles, trailers, and artillery received from ordnance park. 2. Issues to using units. Transportation normally by using unit. 3. Stockage objective—variable. Stocks in field army ordnance direct and general support units and division ordnance units are— a. Part of field army ordnance park supply level. b. Stored for issue to using units. c. Utilized as maintenance float for exchange of serviceable items for unserviceable items.	1. Division units submit requirements to division ordnance unit. Other units submit requirements to supporting field army ordnance direct support unit. 2. All items are normally regulated and issued on requisition within allocations by division, corps, or field army. ³ Direct exchange of serviceable items for unserviceable items will be effected within maintenance float capability of supporting ordnance unit.

¹ See footnotes at end of table.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
11 Ordnance class V (conventional ammunition).	1. Installation: ordnance class V conventional ammunition depot. 2. Military symbol: XXXX 910  Dep 3. Normally two or more located in the field army service area. 4. Operated by one or more ordnance ammunition companies (TOE 9-17). 5. Receives from communications zone. Maintains principal field army reserve. 6. Issues to— a. Ammunition supply points as required. Transportation by field army TC units. b. Using units in field army service area. Transportation by using unit. 7. May store and issue chemical class V. 8. Supply level—3 to 8 days.² Total field army supply level, depot and ASP, is normally 5 to 15 days.	1. Installation: ordnance class V conventional ammunition supply point (ASP). 2. Military symbol: XXXX 911  ASP 3. Normally two or more per corps located in corps rear areas. 4. Operated by ordnance ammunition company (TOE 9-17). 5. Normally receives directly from communications zone. Transportation by communications zone TC units. May receive from field army ordnance class V depot. Transportation by field army TC units. 6. Issues to field army, corps, and division units in corps area to fill approved ammunition requisitions. Transportation by using unit. 7. May store and issue chemical class V. 8. Supply level—2 to 7 days.²	1. Ammunition requisitions are normally for quantities required to fill unit basic loads or in anticipation of immediate expenditure. 2. Division units submit ammunition requisitions to DAO for authentication. Corps and field army units submit ammunition requisitions to designated corps and field army representatives for authentication. 3. Using units present approved ammunition requisitions to designated ordnance class V supply point, or depot, and draw ammunition in unit transportation.
12 Ordnance class V (special ammunition) - - -	1. Installation: ordnance class V special ammunition depot. 2. Military symbol: XXXX 912  Dep 3. Normally one or more located in the field army service area. 4. Operated by one or more ordnance special weapons and missile general support companies (TOE 9-87). 5. Receives from communications zone. Transportation by communications zone TC units.	1. Installation: ordnance class V special ammunition supply point (SASP). 2. Military symbol: XXXX 913  SASP 3. Normally three SASP per corps and three per field army service area. (See note 7 in column 2.) 4. Three SASP are normally operated by one ordnance special weapons and missile direct support company (TOE 9-47). 5. Can receive directly from communications zone or from field army class V special ammunition depot.	1. Ammunition requisitions are normally for quantities required to fill unit prescribed nuclear load (PNL) or as specifically directed by higher headquarters. 2. Division units submit ammunition requisitions to DAO for authentication. Corps and field army units submit ammunition requisitions to designated corps and field army representatives for authentication. 3. Using units present approved ammunition requisitions to designated ordnance SASP and draw ammunition in unit transportation in accordance with existing directives.

See footnotes at end of table.

1	Item	2 Field army service area	3 Corps area	4 Unit supply procedure ¹
12	Ordnance class V (special ammunition) (continued).	6. Issues to special ammunition supply points as required. Transportation by field army TC units. 7. Note that issues to using units in the field army service area are made by special ammunition supply points located in the field army service area. (See colm 3.) 8. Supply level—classified.	6. Issues to field army, corps, and division units to fill approved ammunition requisitions. Transportation by using unit. 7. Supply level—classified.	
13	Quartermaster class I -----	1. Installation: class I depot. 2. Military symbol: XXXX 601  Dep 3. Normally located well forward in field army service area and may operate in two or more locations. 4. Operated by one quartermaster subsistence depot company and five quartermaster service companies. 5. Can handle supplies for 400,000 troops. 6. Unless items such as flour, sugar, etc., are in waterproof containers, limited storage is desired. 7. Levels are established by theater army. Class I level is 5 to 10 days, based on field army's consumption rate.² 8. Supply point in field army service area located to serve field army troops. A portion of the depot may be set aside for issue to field army troops located near the depot.	1. Installation: class I supply point. 2. Military symbol: XXXX 651  SUPPT 3. At least one per corps.⁴ 4. Located as far forward in corps rear area as possible. Should be out of heavy artillery range; dispersed for nuclear defense; on a good road net; located to support units of the corps; as concealed as possible; field army must secure corps clearance for area location. 5. Can supply corps of 100,000 troops. 6. Operated by one quartermaster subsistence supply company when issuing type B or C rations. If type A rations are issued, the unit should be augmented by one platoon of a quartermaster service company. 7. Also located in field army service area to serve field army troops. 8. Levels for field army supply points are established by field army. Normally 2 to 5 days for units supported. In the offense, 2 to 3 days. In defense, 3 to 5 days.	1. Infantry division and armored division. a. Battle groups of the infantry division and battalions of the armored division consolidate requirements for companies and submit consolidated requirements to division quartermaster; separate battalions consolidate for their unit and submit requirements to division quartermaster; attached units submit their requirements to division quartermaster. b. Division quartermaster consolidates class I requirements for division and attached units and submits direct to field army class I supply point. c. Infantry division. Field army transportation hauls from field army supply point to division distributing point, where rations are broken down for major units, separate battalions, and separate companies. Division transportation battalion hauls from division distributing point to units (unit distribution). d. Armored division. (1) Field army transportation hauls from field army supply point to division distributing point, where rations are broken down for major units, separate battalions, and separate companies. (2) Truck platoons of the supply company and field service company, armored quartermaster battalion, haul from division distributing point. 2. Airborne division. a. Elements of the airborne division in making an airborne assault normally carry a 3-day supply of combat rations. Supplies are delivered to using unit (unit distribution from departure airfield) during assault phase and, whenever practicable, during subsequent expansion and consolidation of airhead.

See footnotes at end of table.

1	2	3	4
Item	Field army service area	Corps area	Unit supply procedure ¹
13 Quartermaster class I (continued) -----			b. When air delivery to using unit is not practicable, supplies air delivered to supply and transport company in airhead for further breakdown and delivery to using unit (unit distribution). c. After linkup, field army hauls from field army supply point(s) to division distributing point. Supply and transport company transports from division distributing point to units (unit distribution).
14 Quartermaster class III -----	1. Installation: class III depot. 2. Military symbol: XXXX 620  Dep 3. Normally located well forward in field army service area and may operate in two locations. 4. Operated by elements of one quartermaster petroleum depot company. 5. Can handle class III supplies for 400,000 troops. 6. Levels are established by theater army. Normally class III level for field army is 5 to 10 days, based on field army's consumption rate.² 7. Supply points for class III located to serve field army troops. A portion of the depot may be set aside for issue to field army troops located near depot. 8. Normally two class III supply points located in the field army service area. 9. One petroleum depot company capable of operating 90 miles of pipeline. 10. Bulk class III supplies will be moved as far forward as possible by pipeline.	1. Installation: class III supply point. 2. Military symbol: XXXX 621  SUPPT 3. At least one per corps.⁴ 4. Location—same as for class I. 5. Can supply corps of 100,000 troops. 6. Operated by one quartermaster petroleum supply company. 7. Two or more supply points also located in field army service area to serve field army troops. 8. Levels for field army supply points are established by field army. Normally 2 to 5 days for units the supply point supports. In the offense, 2 to 3 days. In defense 3 to 5 days.	1. Infantry division and armored division. a. Division quartermaster consolidates class III requirements for division, based on unit requests and anticipated requirements. b. Division quartermaster hauls from field army supply point to division distributing point. c. Unit or supply point distribution within division. 2. Airborne division. a. Elements of the airborne division in making an airborne assault normally carry sufficient class III to support its vehicles for 100 miles. Supplies air delivered to using unit (unit distribution from departure airfield) during assault phase and, whenever practicable during subsequent expansion and consolidation of airhead. b. When air delivery to using unit is not practicable, supplies air delivered to supply and transport company in airhead for further breakdown and delivery to using unit (unit distribution). c. After linkup, field army hauls from field army supply point(s) to division distributing point. Supply and transport company transports from division distributing point to units (unit distribution). 3. Normally, any vehicle going to the rear and passing by a class III supply point refills with gasoline before returning to the forward area. 4. Class III is moved in bulk from as far forward as possible.
15 Quartermaster classes II and IV -----	1. Installation: quartermaster class II and IV depot. 2. Military symbol: XXXX 600  Dep	1. Corps units follow same procedure as for division troops except that requisitions are consolidated by battalion and submitted to field army quartermaster class II and IV depot.	1. Infantry division and armored division. a. Battle groups of the infantry division and battalions of the armored division consolidate requirements for classes II and IV for companies and submit consolidated requisitions to division quartermaster.

See footnotes at end of table.

1	Item	2 Field army service area	3 Corps area	4 Unit supply procedure ¹
15	Quartermaster classes II and IV (continued)-	3. Normally located in field army service area and may operate in two locations. 4. Operated by one quartermaster clothing and general supply depot company and one quartermaster service company. 5. Can handle class II and IV supplies for 400,000 troops. 6. Covered storage required—90 percent. 7. Levels are established by theater army. Normally, class II and IV level 5 to 15 days, based on field army requirements. ² 8. Field army commander allocates regulated items to subordinate units. ³	2. Corps allocates regulated items to corps troops and divisions. Requisitions for regulated items must be approved by field army quartermaster, based on field army commander's policies. ³	b. Division quartermaster consolidates or assembles the requirements for the division, to include attached units, and submits same to class II and IV depot except for regulated items, which are submitted to field army quartermaster. ³ c. Infantry division. (1) Field army transportation hauls from field army class II and IV depot to division distributing point. (2) Division transportation battalion hauls from division distributing point to units (unit distribution). ⁵ d. Armored division. (1) Field army transportation hauls from field army class II and IV depot to division distributing point, where supplies are broken down for major units. (2) Units come back to division distributing point for their supplies (supply point distribution). ⁵ 2. Airborne division. a. Supplies air delivered to using unit (unit distribution from departure airfield) during assault phase and, whenever practicable, during subsequent expansion and consolidation of airhead. b. When air delivery to using unit is not practicable, supplies air delivered to supply and transport company in airhead for further breakdown and delivery to using unit (unit distribution). c. After linkup, field army hauls from field army supply point(s) to division distributing point. Supply and transport company transports from division distributing point to units (unit distribution).
16	Signal classes II and IV-----	1. Installation: signal class II and IV depot. 2. Military symbol: XXXX 701  Dep 3. Normally two located in field army service area. 4. Operated by two signal depot companies (TOE 11-158), which are part of field army signal	1. Installation: signal class II and IV supply point. 2. Military symbol: XXXX 703  SUPPT 3. Normally one per corps. Operated by signal forward supply and maintenance company (TOE 11-157), which is part of field army signal supply and maintenance battalion (TOE 11-155).	1. Units prepare single-line item requisitions as requirements develop and submit, without consolidation, through battle group to division signal officer. Division signal battalion maintains a small stock of fast-moving items for immediate issue to division units. 2. When items cannot be supplied within division, the division signal officer submits the requisition, without consolidation, to the field army signal depot. 3. The field army signal supply point effects unit distribution when feasible. Otherwise, the division

See footnotes at end of table.

1 Item	2 Field army service area	3 Corps area	4 Unit supply procedure ¹
16 Signal classes II and IV (continued) - - - - -	supply and maintenance battalion (TOE 11-155). 5. Can handle class II and IV supplies for field army. 6. Covered storage required for 75-90 percent of tonnage. 7. Field army units draw from signal depot, based on field army signal officer's approval. 8. Field army level-5 to 15 days. 9. Regulated items require approval of field army signal officer, based on field army commander's policies.³	4. Normally corps units follow the same procedures as for divisions. 5. Based on field army's allocation of regulated items to corps, corps allocate regulated items to corps troops and divisions. Requisitions for regulated items must be approved by the field army signal officer, based on the field army commander's policies or priorities of issue.³ 6. Nonregulated items are issued on requisition or direct exchange of serviceable items for unserviceable items.	supply section will pick up supplies or make arrangements for units to do so. 4. Division signal supply section arranges for unit distribution to maximum extent possible. When impossible, units will be notified to pick up supplies at the division signal dump when they have been procured. Some wire and the more common batteries are kept on hand and are available within reason by coming for them. 5. All signal units are authorized a prescribed load of wire and fast-moving items, such as common batteries and radio tubes. 6. Nonregulated items will be issued to, or be obtained for, division units on requisition or direct exchange of serviceable items for unserviceable items.
17 Transportation Army aircraft classes II and IV.	1. Installation: transportation Army aircraft class II and IV depot. 2. Military symbol: XXXX 405  Dep 3. At least one located in the field army service area. 4. Operated by the transportation Army general support aircraft supply company. 5. Provides supply support to the transportation Army aircraft maintenance and supply companies, transportation aircraft direct support companies, and transportation Army general support aircraft maintenance companies. 6. Levels established by theater. Will normally be 30 days. 7. The transportation aircraft direct support company located in the field army service area will furnish supply support to aircraft assigned to units within that area. NOTE: Transportation Corps items, such as life preservers, are stored in engineer class II and IV depots.	1. The transportation aircraft direct support company in each corps issues Army aircraft class II and IV supplies to the divisions and to nondivisional units in the corps area, excluding transportation transport aircraft units. 2. Nonregulated items are issued on requisition or direct exchange of serviceable items for unserviceable items. 3. Regulated items are issued on allocations by corps or field army. 4. Supply level-15 days for units supported plus sufficient for own maintenance activities.	1. Divisions and nondivisional units in forward areas requisition and receive supplies through transportation aircraft direct support companies. 2. Transportation transport aircraft battalions requisition and receive supplies from transportation Army aircraft maintenance and supply companies. 3. Nondivisional units operating Army aircraft from locations in the vicinity of the transportation Army general support aircraft supply company may requisition directly from that unit when such action is more economical. 4. In all cases, the flow of supplies may either be through the direct support unit or direct from the transportation Army general support aircraft supply company. Economy and expeditious resupply dictate the channels for the flow of supplies.

¹The phrase "consolidate supply requirements" means for the unit to consolidate into one requisition the requirements for its subordinate and attached units. The phrase "assemble supply requirements" means for the unit to collect and edit the supply requirements for its subordinate units and forward these requirements as separate requisitions for each subordinate unit. Normal procedure is for divisions to include supply requirements for units attached to the division. This procedure is followed except when the unit is attached for a short period of time.

²General levels established by theater which are considered a part of theater stocks do not include levels in supply points, except for class V supplies.

³Regulated items-requisitioned through command channels-however, may be issued against approved command allocations or priorities subject to approval of chief of technical service. At appropriate echelons, the latter authority may be delegated to depot commanders.

⁴Nature of terrain and lines of communications sometimes require additional supply points to support one corps.

⁵Normally, units of the division will come to division trains area to pick up their class II and IV requirements. When unit distribution of supplies is possible, class II and IV supply requirements will be delivered to the unit by the same transportation which delivers class I supply.

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CHAPTER 6

LOGISTICS—EVACUATION AND HOSPITALIZATION

Section I. ESTIMATE OF PATIENTS

6.1. Classification of Patients

a. The term *patient* includes all military personnel excused from duty because of illness, nonbattle injury, and battle wound or injury. For most purposes discussed in this chapter, only those patients who require hospitalization or who are excused from the performance of military duty and not returned to duty within the calendar day of admission to a medical treatment facility need be considered. Patients may be classified in several ways, depending upon the purpose for which such classification is made. It is important to note that not all casualties or nonbattle losses are *patients*.

b. In making estimates of patients or in computing hospital bed requirements, patients are usually classified by cause of disability into *disease*, *nonbattle injury*, and *battle wound or injury*. The latter group falls in the category of battle casualties.

c. Patients may be classified as *hospital patients* or *quarters patients*.

d. In calculating evacuation requirements, patients may be classified by—

- (1) Severity of disability, into *walking* and *litter* patients.
- (2) Suitability for evacuation, into *transportable* and *nontransportable* patients.
- (3) Suitability for evacuation by air.
- (4) Type of accommodation required for evacuation, into *recumbent* and *sitting* patients.

6.2. Admission Rate

The incidence of disease, injury, and wounding is usually expressed in the military services in terms of the number of admissions per 1,000 average strength per year. The admission rate may be for all causes, for all diseases, for all nonbattle injuries, or for all battle wounds or

injuries. The admission rate may also be computed for specific diseases or types of injuries. For purposes of logistical estimation or for planning for hospitalization requirements, the admission rate is most conveniently expressed as a *daily admission rate to hospital* per 1,000 average strength.

*Daily Admission Rate to Hospitals Per 1,000 Strength—
All Causes¹*

Years	Total Army	ETO	MTO	Pacific
1942-45.....	1.48	1.04	1.83	1.53
			FECOM	Korea
1950-53.....	0.83	0.72	0.95	1.07

¹In using experience factors from theaters of operation, it must be borne in mind that battle injury and wound rates are not primarily related to geography. In using such rates for planning purposes, it is necessary to consider the theater from the standpoint of type of combat, size and organization of forces, and weapons employment.

6.3. Disease and Nonbattle Injury

a. Diseases and nonbattle injuries among combat troops of a seasoned command, except in a particularly unhealthful region, may be expected to produce a daily admission rate to medical treatment facilities (hospital and quarters combined) of about 3 per 1,000 per day (0.3% per day). This *average* rate can be expected at certain seasons of the year, without epidemics, to reach 0.5 percent or even more. As an estimate for planning, *one-third* of these patients may be expected to remain under treatment in their own organization (at aid stations) or in the division clearing stations *if there is no interference with the primary mission of reception, treatment, and evacuation of casualties*. About two-thirds of the disease and nonbattle cases may be evacuated from the division area. Thus, one-third of the patients are *quarters* cases and two-thirds of the patients are *hospital* cases.

b. The daily admission rate to hospitals from disease and nonbattle injuries is shown as follows:

*Daily Admission Rate to Hospitals Per 1,000 Strength—
Disease and Nonbattle Injury*

Years	Total Army	ETO	MTO	Pacific
1942-45.....	1.42	0.80	1.62	1.44
		EUCOM	FECOM	Korea
1950-53.....	0.78	0.72	0.72	0.73

This daily admission rate to *hospital* will correspond to an admission rate to *hospital and quarters* of about 0.3 percent and soon will result in a constant noneffective rate of about 4.5 percent. For unseasoned troops in the same climatic condition, the noneffective rate may reach 6 percent and will be even higher under unfavorable conditions of climate and location.

c. On the basis of experience in the Mediterranean Theater of Operations during World War II for *disease and nonbattle injury*, it may be expected that about 0.2 percent will die, 4 percent will be evacuated to the continental United States (CONUS), and the remainder, 95.8 percent, eventually will return to duty. The average stay in hospitals in a theater for nonbattle cases admitted to hospitals overseas during World War II was 19 days; while the total average hospitalization, including time spent in CONUS hospitals, was 25 days.

d. For planning purposes, certain additional estimated daily *hospital* admission rates from *disease and nonbattle injuries* in overseas commands are as follows:

*Estimated Disease and Nonbattle Injury Hospital
Admission Rate (Admissions Per 1,000
Average Strength Per Day)*

Major overseas command	Daily rate per 1,000
Alaska	0.9
Austria	0.8
Caribbean	1.0
Europe	1.0
Far East	1.2
Pacific	0.9

The rates shown above have been prepared to provide data for future planning. The data have been based on Army experience over the 2 fiscal years from July 1950 through June 1952. It should be borne in mind, however, that these rates reflect an experience unlike that of World War II. During World War II, U.S. Army troop were engaged in combat in several major oversea areas. In the experience on which the

above rates have been based, all areas were free from the effect of combat with the exception of the Far East. Because of such limitations, care should be exercised in the use and interpretation of the data shown above.

6.4. Battle Casualties

a. In estimating battle injuries and wounds, many variable factors must be considered. These include type of troops, their location in the theater, type of engagement, and enemy capabilities. For this reason, it is desirable in such estimations to separate all troops in a theater into groups having approximately the same casualty rate and compute the patients separately for each group on the basis of their numerical strength. For example, in a given theater the troops may be grouped into combat divisions, other ground troops in the combat zone, Air Force troops, and troops in the communications zone. Each of these groups will have a different battle injury and wound rate, and the total patients in the theater will depend on the relative strength of each group.

b. The average daily admission rates for battle casualties in various theaters were as follows:

*Daily Admission Rate to Hospitals Per 1,000 Strength—
Battle Injury and Wound¹*

Years	Total Army	ETO	MTO	Pacific
1942-43.....	0.06	.24	0.21	0.08
1944-45.....	0.10	0.26	0.22	0.10
		EUCOM	FECOM	Korea
1950-53.....	0.05	----	0.22	0.34

¹In using experience factors from theaters of operation, it must be borne in mind that battle injury and wound rates are not primarily related to geography. In using such rates for planning purposes, it is necessary to consider the theater from the standpoint of type combat, size and organization of forces, and weapons employment.

c. In estimating battle injury and wound patients in a field army, an estimate based on combat divisions engaged usually will be more accurate than one based on a rate for corps or the field army.

d. Considerable variation in battle injury and wound admission rates among Air Force troops occurs, depending on the type of aircraft, type of mission flown, and amount of enemy air resistance. As an overall average, which necessarily must be modified to apply to any

special situation, battle injury and wound admission rate for all air troops can be taken as 0.2 per 1,000 per day. More commonly, casualties in Air Force troops are computed on the basis of the number of man-missions flown.

e. The number of battle injuries and wounds among communications zone troops, except in special situations, has been negligible in the past. However, planners in future warfare must consider the possibility of mass casualties in rear areas.

f. The ratio of killed and wounded among casualties has been estimated as follows: (The figures do not include prisoners or persons missing in action.)

	<i>World War II Infantry:</i>	<i>Ratio of killed to wounded— World War II and Korea</i>
European Theater of Operations_____		1:4
Mediterranean Theater of Operations_		1:4
U.S. Army forces in Pacific_____		1:4
All theaters combined_____		1:4
Total air forces, all theaters_____		5:4
Armored, all theaters_____		2:7
Artillery, all theaters_____		1:4
	<i>Korea</i>	
Infantry _____		1:4
Armored _____		1:4
Artillery _____		1:4

- (1) In temperate and tropic zones, the overall ratio of killed to wounded may be taken as 1:4.
- (2) In the arctic zones, the ratio of killed to wounded may be considerably higher because of the rapid death of the wounded from exposure to cold.
- (3) On the basis of experience in World War II (in general, under a 120-day evacuation policy), it may be expected that about 4 percent of the wounded who reach hospitals will die; about 25 percent will be invalided home, and the remaining 71 percent will be returned to duty in the theater. Of those evacuated to CONUS, about 45 percent will return to duty. The average stay of wounded personnel in oversea and CONUS hospitals in World War II was 94 days.

- (4) Of the wounded who reached hospitals in World War II, about 4 percent died and about—

17 percent recovered in 15 days.
13 percent recovered in 16 to 30 days.
17 percent recovered in 31 to 60 days.
11 percent recovered in 61 to 90 days.
20 percent recovered after 90 days.
18 percent were separated from the Army.

- (5) Of the wounded who reached hospitals in the Korean War, about 2 percent died and about—

17 percent recovered in 15 days.
15 percent recovered in 16 to 30 days.
24 percent recovered in 31 to 60 days
12 percent recovered in 61 to 90 days.
21 percent recovered after 90 days.
9 percent were separated from the Army.

- (6) In World War I¹, it was found that of the gas casualties who reached hospitals, approximately—

2 percent died.
25 percent recovered in 15 days.
27 percent recovered in 16 to 30 days.
24 percent recovered in 31 to 60 days.
16 percent recovered after 60 days.
6 percent were of no further military value.

- (7) In World War I¹, the average stay of gas casualties in oversea and CONUS hospitals was 41.8 days.

¹ The figures are based on World War I chemical agents, tactics, and medical treatment methods. These figures may be expected to change greatly with modern chemical agents.

6.5. Statistics

The following tables represent statistics from World War II. To be used as staff planning factors, they may require modifications, depending on the conditions anticipated.

a. Average Daily Admission Rate Per 1,000 From All Causes.

1	1	2	3	4	5	6
	Combat conditions	Inf div	Armd div	Abn div	Combat zone	COMMZ
2	Heavy-----	8	7	11	5	1.5
3	Average-----	4	4	4	3	1.5
4	Light-----	2	2	2	2	1.5

b. Average Daily Admission Rate Per 1,000 Air Force Troops.

	1	2	3	4
1	Location	Disease and non-battle injury	Battle injury and wound	Total
2	Pacific areas ¹ -----	2.01	0.02	2.03
3	European areas ² -----	1.87	0.27	2.14
4	Average active combat---	1.80	0.20	2.00

¹ Includes Far East air forces, Twentieth Air Force, and China-Burma-India air forces.

² Includes air forces in European and Mediterranean Theaters of Operation.

Section II. FIXED-BED REQUIREMENTS

6.6. General

The hospital requirements of a theater of operations are computed in terms of total beds in hospitals capable of performing all types of treatment, not in terms of medical units. The total authorization to meet these requirements is expressed as the fixed-bed allotment of the theater of operations. Medical units of the combat zone and a convalescent center of the communications zone are not included in the computation. Field hospitals are included in this allotment only when they are employed as fixed hospitals in the communications zone. In general, the fixed-hospital bed requirements of a theater of operations are satisfied by the assignment to the communications zone of appropriate numbers of general hospitals and station hospitals. For classified data pertaining to fixed-bed requirements, see FM 101-10, part III, chapter 5, section VII.

6.7. Basic Data

a. General. To compute bed requirements for any specific situation, certain basic data are necessary. These are—

- (1) Time period (Period of estimate, covered usually in 30-day intervals)
- (2) Troop strength (Population covered)

- (3) Daily admission rate (Rate of generation of patients)
- (4) Experience factors for accumulation of patients, dependent on evacuation policy (Rate of patient-load growth)
- (5) Dispersion factor (Patient-bed conversion factor)

All experience factors ((4) above) are based on the proportion of patients out of those admitted to hospital on 1 day and still remaining on each succeeding day. When these daily remaining factors (proportions) are accumulated by intervals of 30 days, the resultant accumulation factors (see table in *d* below) can be used directly, providing the admission rate, troop strength, and evacuation policy are assumed to be constant. However, when any or all of the elements of admission rate, troop strength, or evacuation policy vary for one or more of the 30-day intervals in the time period covered, the daily remaining factors (see table in *e* below) may be accumulated through a 30-day period, at which time admissions cease, and then decumulated each succeeding day thereafter. (Decumulation is the reverse of the process of accumulation; i.e., it is the reduction of a total by

successive decrements.) Since this latter application is a lengthy process, becoming more complex under changing evacuation policies, other sets of experience factors based on the accumulation-decumulation of patients under specified assumptions regarding changes in evacuation policy have been developed. For tables of these factors and their detailed method of use, see FM 8-55, chapter 8.

b. Daily Admission Rates. See paragraph 6.2.

c. Evacuation Policy. The evacuation policy of a joint theater of operations is established by the Joint Chiefs of Staff, usually on the recommendation of the theater commander or the military departments. It determines which patients will be evacuated to CONUS by designating a maximum number of days for the allowable period of hospitalization within the theater. Patients who, in the opinion of responsible medical officers, cannot be returned to duty status within the period prescribed, are to be returned to CONUS by the first available and suitable transportation, providing the travel required will not aggravate their disabilities. In using the evacuation policy to determine theater fixed-bed requirements, the periods usually considered are 30, 60, 90, or 120 days.

- (1) *Evacuation policies within a theater* may be established for certain areas and for certain types of medical facilities, specifying which patients will be evacuated to the next higher echelon of medical care. *For example*, a shorter evacuation policy may be established for station hospitals than for the theater as a whole. This will mean

that patients admitted to station hospitals whose recovery is likely to require more than the number of days in the shorter policy will be evacuated to general hospitals. This operation will in no way affect the total fixed-bed requirements of the theater, providing proper adjustment is made in the distribution of total theater fixed beds between station and general hospitals on the basis of their different evacuation policies.

- (2) Certain flexible evacuation policies, useful as guides but varying with manpower policies, admission rates, and available beds, may be established for the combat zone.
- (3) By setting a maximum for the number of days a patient may be retained in theater hospitals, the evacuation policy exercises a limiting effect on the growth of the patient-load in the theater. While the evacuation policy alone does not enter directly as a computational factor in the estimation of fixed-bed requirements, it does determine which set of accumulation factors it is appropriate to use.

d. Accumulation Factors. Accumulation factors indicate how many patients will have accumulated at specified periods of time after the beginning of operations, based on a constant admission rate of one patient per day and a constant fixed evacuation policy. Separate sets of factors are provided for the different evacuation policies and for the separate theater and CONUS accumulation of patients as affected by these evacuation policies.

Accumulation Factors¹
(Periods of estimate in intervals of 30 days)

	1	2	3	4	5	6	7	8	9	10
1	Periods of estimate	THEATER FACTORS								Periods of estimate
		Evacuation policies								
		120-day		90-day		60-day		30-day		
		Disease and non- battle injuries	Battle injuries and wounds	Disease and non- battle injuries	Battle injuries and wounds	Disease and non- battle injuries	Battle injuries and wounds	Disease and non- battle injuries	Battle injuries and wounds	
2	30	13.43	22.96	13.34	22.39	13.11	21.04	11.40	16.44	30
3	60	16.46	33.38	15.95	31.00	14.67	25.57	11.40	16.44	60
4	90	17.67	37.36	16.51	32.87	14.67	25.57	11.40	16.44	90
5	120	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	120
6	150 and over	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	150 and over
CONUS FACTORS										
7	30	0.13	1.55	0.22	2.12	0.45	3.47	2.16	8.07	30
8	60	0.76	6.88	1.27	9.26	2.55	14.69	5.82	23.82	60
9	90	1.80	13.43	2.69	17.92	4.80	25.22	8.07	34.35	90
10	120	3.06	20.35	4.49	25.75	6.33	33.05	9.60	42.18	120
11	150	4.05	26.59	5.48	31.99	7.32	39.29	10.59	48.42	150
12	180	4.67	31.66	6.10	37.06	7.94	44.36	11.21	53.49	180
13	210	5.05	35.86	6.48	41.26	8.32	48.56	11.59	57.69	210
14	240	5.29	39.40	6.72	44.80	8.56	52.10	11.83	61.23	240
15	270	5.44	42.37	6.87	47.77	8.71	55.07	11.98	64.20	270
16	300	5.54	44.89	6.97	50.29	8.81	57.59	12.08	66.72	300
17	330	5.60	47.02	7.03	52.42	8.87	59.72	12.14	68.85	330
18	360	5.64	48.79	7.07	54.19	8.91	61.49	12.18	70.62	360
19	390	5.67	50.26	7.10	55.66	8.94	62.96	12.21	72.09	390
20	420	5.70	51.46	7.13	56.86	8.97	64.16	12.24	73.29	420
21	450	5.71	52.39	7.14	57.79	8.98	65.09	12.25	74.22	450
22	480	5.72	53.14	7.15	58.54	8.99	65.84	12.26	74.97	480
23	510	5.73	53.71	7.16	59.11	9.00	66.41	12.27	75.54	510
24	540	5.73	54.16	7.16	59.56	9.00	66.86	12.27	75.99	540
25	570	5.73	54.52	7.16	59.92	9.00	67.22	12.27	76.35	570
26	600	5.73	54.79	7.16	60.19	9.00	67.49	12.27	76.62	600
27	630 and over	5.73	55.00	7.16	60.40	9.00	67.70	12.27	76.83	630 and over

¹Based on constant admission of one per day under stated evacuation policies.

e. Remaining Factors. Remaining factors show for the number of patients admitted on any 1 day the proportion still remaining on each day thereafter. This provides the data from which tables of accumulation factors and accu-

mulation-decumulation factors are based. However, the application is a lengthier process, since computations by single days of operation are necessary.

*Patients Remaining in Hospital Anywhere, By Type of Patient
(Remaining factors for patients admitted to hospital on any 1 day of operations
based on admission of one on a day of operations in theater)*

1	2	3	4	5	6	7	8	9
Complete hospital days	Disease and nonbattle injuries	Battle injuries and wounds	Complete hospital days	Disease and nonbattle injuries	Battle injuries and wounds	Complete hospital days	Disease and nonbattle injuries	Battle injuries and wounds
1	1.000	1.000	31	0.167	0.650	65	0.086	0.393
2	0.974	0.984	32	0.163	0.640	70	0.079	0.370
3	0.926	0.972	33	0.158	0.631	75	0.076	0.350
4	0.865	0.958	34	0.155	0.620	80	0.070	0.331
5	0.797	0.942	35	0.150	0.611	85	0.065	0.315
6	0.730	0.927	36	0.147	0.602	90	0.062	0.298
7	0.669	0.911	37	0.144	0.592	95	0.057	0.284
8	0.610	0.897	38	0.140	0.583	100	0.054	0.272
9	0.557	0.883	39	0.136	0.575	105	0.051	0.260
10	0.513	0.870	40	0.131	0.566	110	0.049	0.250
11	0.481	0.860	41	0.129	0.557	115	0.046	0.241
12	0.445	0.850	42	0.127	0.549	120	0.043	0.232
13	0.425	0.840	43	0.125	0.540	130	0.036	0.216
14	0.399	0.828	44	0.122	0.532	140	0.031	0.200
15	0.375	0.817	45	0.120	0.524	150	0.026	0.187
16	0.351	0.806	46	0.116	0.516	160	0.025	0.174
17	0.332	0.795	47	0.115	0.508	170	0.021	0.163
18	0.316	0.784	48	0.113	0.500	180	0.016	0.154
19	0.302	0.772	49	0.109	0.492	210	0.010	0.128
20	0.285	0.761	50	0.107	0.485	240	0.006	0.109
21	0.271	0.750	51	0.106	0.477	270	0.004	0.092
22	0.258	0.740	52	0.105	0.470	300	0.003	0.078
23	0.246	0.730	53	0.103	0.464	330	0.002	0.065
24	0.235	0.720	54	0.101	0.457	360	0.001	0.054
25	0.224	0.708	55	0.100	0.450	390	0.001	0.044
26	0.213	0.700	56	0.098	0.444	420	0.001	0.036
27	0.205	0.690	57	0.096	0.438	450	0.000	0.028
28	0.196	0.680	58	0.095	0.432	480	0.000	0.022
29	0.189	0.670	59	0.094	0.425	510	0.000	0.017
30	0.173	0.660	60	0.091	0.420	540 and over	0.000	0.013

f. Time Period Covered. The time period in a particular estimate is that period from the beginning of operations to a maximum number of days of operations which are included in the estimate. Experience factors for patient-load growth are always related to *periods of estimate*, which are included in the overall time

period covered. These periods of estimate are usually stated in 30-day intervals. Accumulation factors are always directly related to that period of estimate which is equal to the maximum number of days in the time period covered; i.e., an accumulation factor at the 90-day interval is used for a 90-day period of esti-

mate. Remaining factors, however, are related to each separate daily interval included in the overall estimate, depending on the maximum number of days a particular day of admission contributes to the overall time period covered. For example, this process would include 90 separate daily intervals within a 90-day period of estimate.

g. Dispersion Factor. At any given time, a certain proportion of theater fixed beds will not be immediately available to patients because of "dispersion." (A 20-percent allowance for dispersion was generally used during World War II.) Factors contributing to dispersion are as follows:

- (1) A certain number of beds must be packed and in transit. The greater the mobility of the troops, the greater the allowance required.
- (2) Smaller troop units operating at some distance from the main body of troops must be supported by complete hospital units, even though it is realized that the troop unit will not be likely to use fully the hospital facilities provided.
- (3) The general practice of prescribing separate wards for patients of different sexes, cases of contagious diseases,

and for cases requiring different types of treatment necessitates a safety margin in each ward since the proportion of the various classes will vary from time to time.

- (4) Factors to be applied to number of patients to convert to number of fixed beds required under each specified dispersion allowance are as follows:

Dispersion allowance (percentage)	Dispersion factor
5	1.05
10	1.11
15	1.18
20	1.25
25	1.33
30	1.43
35	1.54
40	1.67
45	1.82
50	2.00

6.8. Computations

a. Given the items of basic data, the fixed-hospital bed requirements for a specific situation, wherein the elements of admission rate, troop strength, and evacuation policy are assumed to be *constant* during the time period covered, can be computed according to the following formula:

$$\begin{array}{ccccccc} \text{Daily admission rate} & \times & \text{Average strength (thousands)} & \times & \text{Accumulation factor at time period covered in estimate} & \times & \text{Dispersion factor} & = & \text{Fixed beds} \end{array}$$

Example: Theater "A" has a troop strength of 500,000. Expected daily admission rates per 1,000 are as follows: disease and nonbattle injuries, 0.73; conventional battle injuries and

wounds, 0.34. Theater evacuation policy is to be 120 days and the dispersion allowance is 20 percent. How many fixed-hospital beds will be required at the end of 90 days?

	Admission rate		Troop strength (thousands)		Accumulation factor (90 days)		Dispersion factor		Fixed beds
Disease and nonbattle injuries.	0.73	×	500	×	17.67	×	1.25	=	8,062
Conventional battle casualties.	0.34	×	500	×	37.36	×	1.25	=	7,939

Total fixed beds required at the end of 90 days									16,001

In the above example, the accumulation factors were obtained from the table in paragraph 6.7d. The proper accumulation factor is shown on line 4 in both instances—column 2 for disease and nonbattle injury patients; and column 3 for battle injury and wound patients.

Day of operation ¹	Intervals of period of estimate			
1	Time period covered	Admission rate for respective day of operation	×	Average strength (thousands) for respective day of operation
2	Next lower daily interval			
3	Next lower daily interval			
4	Next lower daily interval			
5	Next lower daily interval			
Etc.	Etc. to lowest interval (1 day)			
			×	Remaining factor at respective daily interval applicable to day of operation.

¹ Each day is computed separately, the products added, and the sum of the products is then multiplied by the dispersion factor. However, when the daily admission rate and average strength are constant, the respective remaining factors through a given time may be added. The sum obtained is then multiplied by the product of the daily admission rate times the average strength (in thousands). The product thus obtained is then multiplied by the dispersion factor.

- (1) For evacuation policies shorter than 30 days, the number of days in the stated evacuation policy, less 1 day, is always the time period covered as shown in the above formula. For example, under a 10-day evacuation policy, patients admitted on any 1 day of operations, and who are remaining after 10 complete hospital days, represent the number from any day's admissions who cannot be returned to duty status within the time allowed (10 days) and, therefore, are evacuated from the theater between 1 and 9 days after admission to hospital. Under a 10-day evacuation policy, the maximum accumulation of patients in theater hospitals can only be the sum of these patients who have lost from 1 to 9 complete hospital days at any period of operations. Patients from any 1 day's admission who are remaining in *theater hospitals* at the beginning of the tenth hospital day are

b. When one, two, or all three of the elements of admission rate, troop strength, or evacuation policy vary from day to day within the time period covered, the fixed-bed requirements can be computed according to the following formula:

- those who will be returned to duty in the theater on the tenth day.
- (2) For evacuation policies of 30 days or longer, the number of days in the stated evacuation policy is always the time period as shown in the formula. Since the accumulation factors take into account the place of hospitalization (theater or CONUS) in addition to the hospital days in theater prior to evacuation, the accumulation of the remaining factors from the first day through the number of days of the evacuation policy will always equal the sum of the theater and CONUS accumulation factors at that point in time. Therefore, the proportion who are theater patients is readily available from the accumulation factors (see table in par. 6.7d). The difference between these longer policies and the 10-day evacuation policy is that CONUS patients, who are represented by the remaining factors at 10 com-

plete hospital days, are not included in the computation for the shorter policy. In order to include CONUS patients under the shorter evacuation policies, the remaining factors would then be accumulated through the number of days in the evacuation policy; in the example given here, the addition would be through 10 days. (For problem examples, see FM 8-55, ch. 8.)

c. *Nuclear, Biological, and Chemical Warfare.* While the preceding computations afford a relatively sound basis for determining fixed-bed requirements, nuclear, biological, and chemical warfare introduces other factors. The experience factors presented in this chapter have been derived in the presence of a certain pattern of wounding and are related to average admission rates over long periods. The pattern of wounding from nuclear, biological, and chemical weapons will probably alter accumulation factors. Of greatest significance, however, may be the characteristic wide fluctuation of daily admission rates resulting from these weapons. This characteristic may render any attempt to employ average admission rates futile. The problem will be one of handling recurring peak-

loads of patients. This problem must be met either by very efficient use of theater hospital facilities or by rapid and extensive evacuation to CONUS. For this reason, the planner may find it more realistic to submit fixed-bed requirements as a feasible percentage of troop strength supported and build the maximum flexibility into the resulting medical service.

6.9. Continental United States

a. Fixed beds are required in CONUS for those troops who do not depart for theaters of operations. When new recruits are being inducted in large numbers, morbidity tends to be rather high and beds equal in number to as much as 4 percent of the CONUS strength may be necessary. After the period of training is over, beds equal in number to about 3 percent of the CONUS strength may be sufficient.

b. It also is necessary to compute bed requirements for those cases evacuated from theaters of operation. These additional beds are estimated on the basis of the expected numbers of evacuees arriving in CONUS (disease and nonbattle injury and casualty cases being separately considered) and the average duration of stay of such cases in CONUS hospitals.

*Accumulation of Theater of Operations Patients in CONUS Hospitals—
120-Day Evacuation Policy¹*

	1	2	3	4	5	6	7	8
1	Cause of admission	Daily hospital admission rate per 1,000	Accumulation of theater patients in CONUS hospitals per 1,000 theater strength after number of days indicated following start of operations in the theater					
			60	90	120	180	260	540
2	Disease and nonbattle injury	1.0	0.60	1.07	1.50	3.11	4.08	4.17
3	Wounded	0.6	2.05	5.20	8.79	16.32	26.43	28.48
4	Total patients		2.65	6.27	10.29	19.43	30.51	32.65
5	Increase by 26 percent		0.66	1.57	2.57	4.86	7.63	8.16
6	Total beds required		3.31	7.84	12.86	24.29	38.14	40.81

¹ Based on July to December 1944 ETO admission rates

c. Using the data given for the problem in paragraph 6.8a, the accumulation of theater of operations patients in CONUS hospitals after

90, 150, and 360 days of operation in the theater (under a 120-day evacuation policy) may be determined as follows:

	Daily admission rate		Troop strength (thousands)		90 days	150 days	360 days
Disease and nonbattle injury.....	0.73	×	500	×	1.80	4.05	5.64
Conventional battle casualties.....	0.34	×	500	×	13.43	26.59	48.79
Total patients—							
Disease and nonbattle injury.....					657	1,478	2,059
Battle injury and wound.....					2,283	4,520	8,294
					2,940	5,998	10,353
Dispersion allowance 20 percent.....				×	1.25	×	1.25
Total beds required.....					3,675	7,498	12,941

In the above example, the accumulation factors were obtained from the table in paragraph 6.7d, lines 9, 11, and 18, respectively—column 2 for disease and nonbattle injury patients and column 3 for battle injury and wound patients.

d. To the above figures must be added an

allowance, when appropriate, for care of Navy, Air Force, Allied military personnel, Allied civilians, and prisoners of war. The additional number of fixed beds for such purposes will depend on the particular area involved, and no definite figures can be given.

Section III. PATIENT EVACUATION

6.10. Planning Factors

a. Disease and Nonbattle Injuries.

Evacuated From Theater Out of Admissions During 1 Month of Operations

	1	2	3	4	5	6	7
1	Evacuation policy	Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day.....	0.44	1.73	1.49	0.88	0.19	4.73
3	90-day.....	0.74	2.83	2.26	0.60	-----	6.43
4	60-day.....	1.51	5.57	2.16	-----	-----	9.24
5	30-day.....	7.22	10.08	-----	-----	-----	17.30

b. Battle Injuries and Wounds.

Evacuated From Theater Out of Admissions During 1 Month of Operations

	1	2	3	4	5	6	7
1	Evacuation policy	Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day.....	5.15	12.62	4.06	1.34	0.23	23.40
3	90-day.....	7.07	16.74	5.07	0.98	-----	29.86
4	60-day.....	11.56	25.84	4.60	-----	-----	42.00
5	30-day.....	26.90	39.10	-----	-----	-----	66.00

6.11. Capacity of Transportation

1	Type of transportation	Patients	
		Ambu- or Litter latory	Patients
2	Transport airplane (C-97).....	60	50
3	Transport airplane (C-118).....	60	54
4	Transport airplane (C-119).....	40	30
5	Transport airplane (C-121).....	60	60
6	Transport airplane (C-123).....	40	30
7	Transport airplane (C-124).....	60	60
8	Transport airplane (C-130).....	60	60
9	Army airplane (L-19A).....	1	-----
10	Army airplane (L-20A).....	4	2
11	Army airplane (L-23D).....	5	-----
12	Army airplane (U-1A).....	9	6
13	Army airplane (AC-1).....	31	14
14	Army helicopter (H-13G and H).....	2	2
15	Army helicopter (H-19D).....	3	3
16	Army helicopter (H-21C).....	12	12
17	Army helicopter (H-23C and D).....	2	2
18	Army helicopter (H-34A).....	18	8
19	Army helicopter (H-37A).....	28	24
20	Army helicopter (HU-1A).....	4	2
21	Army helicopter (HC-1B).....	32	24
22	Bus, motor, 37-passenger, convertible.....	37	18
23	Truck, ambulance, frontline, ¼-ton, 4 x 4.....	5	2
24	Truck, ambulance, field, ¾-ton, 4 x 4.....	8	5
25	Truck, cargo, 2½-ton, 6 x 6 ²	16	18
26	DUKW ²	³ 25	12
27	BARC.....	125	-----
28	Railway car, coach (U.S.).....	52	-----
29	Railway car, coach (foreign).....	54-72	-----
30	Pullman car (U.S.).....	48	32
31	Sleeping car (foreign).....	32	32
32	Ambulance car, ward (U.S.).....	35	35
33	Ambulance car, ward (foreign).....	30	30
34	Ambulance car, personnel (foreign).....	21	21
35	LVT.....	12	6
36	LVTP-5.....	34	-----

1	Type of transportation	Patients	
		Ambu- or Litter latory	Patients
37	LVTP-6.....	20	-----
38	LCVP.....	36	⁴ 17
39	LCM(6).....	120	30
40	LCM(8).....	⁵ 200	⁶ 50
41	LCU.....	400	100
42	LST.....	180	120
43	Hospital ship (AH).....	802	802

¹ Exact figures for Army aircraft in columns 2 and 3 must be computed on maximum gross weight. See paragraph 7.43b.

² To be used only when ambulance-type vehicles are not available.

³ No troop seats provided.

⁴ Only seven litters if LCVP is to be hoisted aboard for loading.

⁵ In addition to litter patients.

⁶ In addition to ambulatory patients.

6.12. Time Elements of Evacuation

Following are factors for evacuation of personnel (including loading and unloading):

a. Litter Squads.

- (1) Average terrain, four-man squad—1,000 yards and return in 1 hour.
- (2) Mountainous terrain, six-man squad—400 yards and return in 1 hour.

b. Ambulance, Motor, During Combat, in Division Area. Five miles and return in 1 hour.

c. Aircraft.

- (1) Helicopter—50 miles one way in 1 hour.
- (2) Transport airplane—100 miles one way in 1 hour.
- (3) Army airplane—75 miles one way in 1 hour.

CHAPTER 7

LOGISTICS—TRANSPORTATION

Section I. GENERAL

7.1 Chapter Contents

This chapter contains detailed unclassified data on transportation capabilities and methods of computing transportation requirements. The contents have been organized to present a general section on transportation planning and a separate section on each of the major means of transportation required to support military operations. (For classified data pertaining to transportation, see FM 101-10, part III, ch. 5.)

7.2. Transportation Estimates and Plans

a. Transportation estimates and plans are necessarily dependent on the user of transportation, whose firm requirements are often not available until after tactical plans and supply service plans have been completed. In order for transportation planners to plan concurrently with other staff agencies, it is often necessary for them to adopt methods of utilizing troop strength and requirement factors that will permit a reasonable estimate of transportation requirements in broad terms, to be defined at a later date in terms of class and service (or item) of supplies and categories of personnel or troop units.

b. Transportation planning embraces the following:

- (1) Surveying existing and potential facilities for movement of troops and supplies.
- (2) Selecting the available means of movement which provide the greatest flexibility, based on a study of the existing and potential facilities.
- (3) Planning for the maximum utilization of carrying capacity.
- (4) Insuring that the transportation plan provides for flexibility.

7.3. Capabilities of Lines of Communications

a. The capabilities of lines of communications are quantitative statements of the ability of the lines to transport cargo or troops and are usually expressed in tons (long or short) or troops per day. Frequently, troops per day may be equated to tons per day to provide a common unit of measure. A ton-mile is the actual movement of 1 ton 1 mile. A *forward* ton-mile is the actual *forward* movement of 1 ton 1 mile and provides for the return trip of the carrier.

b. Capabilities are dependent on the following factors, one of which will always limit the capability of the line of communications:

- (1) Capacity of the transportation means, which is dependent on density and speed of movement. Density is dependent on speed, which, in turn, is dependent on the physical characteristics of the way. Critical density is the density of traffic when the volume is at possible capacity of the roadway. At a density either greater or less than critical density, the volume of traffic will be decreased. Critical density occurs when all vehicles are moving at or about optimum speed.
- (2) Number and lift capacities of available transportation mediums.
- (3) Turnaround time (time required for a complete cycle of movement), which is dependent on speed of transportation mediums; speed of loading and unloading; and time consumed in maintenance, miscellaneous delays, and operation en route.
- (4) Efficiency of management and maintenance organization.

c. Efficiency of management is an intangible factor, which may enter arithmetical calculations of capability only by experience or estimate. Such efficiency is dependent on number and skill of operating personnel, degree of intelligent movement planning, and effectiveness of operating technique.

7.4. Advance Transportation Planning Factors

When it is desirable to obtain an estimate of transportation requirements well in advance of detailed planning, the following general averages may be used:

a. Cargo Ships.

Capacity	5,600 short tons of Army cargo.
Discharge rate	720 short tons per day discharging alongside berth.
Discharge rate	720 short tons per day discharging in stream.
Beach capacity	1,700 short tons per 1,000 yards of beach.
Amphibious truck capacity.	720 short tons per amphibious truck company per day.
Loading rate	500 short tons per day loading alongside berth or in stream.
Light, medium, and heavy boat company capacity.	1,440 short tons per boat company per day.

b. Shipping Requirements for an Assault Division Slice of 25,000 Men.

	1	2	3
1	Type	Extended voyage (10 days)	Short voyage (2-3 days)
2	AGC (amphibious force flagship)---	1	-----
3	APA (transport, attack)-----	10	1
4	AKA (cargo ship, attack)-----	2	2
5	LST (landing ship, tank)-----	25	50
6	LSD (landing ship, dock)-----	7	7
7	LPH (landing platform, helicopter)---	6	6
8	LPD (landing platform, dock)-----	7	7

c. Water Terminal and Beach Operations. Unless other factors govern to provide dispersion and to present less favorable targets to the enemy, plans should provide for the discharge of not less than 40 percent of tonnage

over the beach and through shallow-draft facilities. As friendly capabilities decrease and as destructive magnitude of enemy weapons increases, this "over-the-shore" proportion should be increased to reduce dependence on major water terminals to support military operations.

d. *Percentage of Organizations and Supply Moved in Assault or Cargo Craft in Amphibious Operations.* Supply as used below refers to accompanying supply. After the assault phase, supply is by cargo shipping only, except for emergency supply. Percentages are as follows (To be used only when assault lift is not known):

- (1) Eighty percent of the total personnel moved in assault naval shipping.
- (2) Twenty percent of the total personnel moved in cargo-type shipping.
- (3) Sixty percent of the organizational equipment and supplies for units moved in assault naval shipping will accompany the units transported in that shipping.
- (4) Forty percent of the organizational equipment and supplies for units moved in assault naval shipping will be transported in cargo-type shipping.
- (5) Because of space or other factors, it sometimes is not possible to move all of the organizational equipment and supplies of a unit on the same ship. These supplies and equipment, in such case, may be moved on another ship of the same convoy, providing sufficient personnel from the parent unit accompany them.

e. Railways (foreign countries).¹

(1) Standard gage (56½ in.).

Single track ---- 10 trains (4,000 short tons) per day in each direction (will support about 6 divisions).

Double track ---- 30 trains (12,000 short tons) per day in each direction (will support about 18 divisions).

¹ For planning purposes, new carload (payload) is computed at 50 percent of its rated capacity. U.S. equipment overseas box, gondolas, and flatcars, 40 tons rated capacity (standard gage); 30 tons rated capacity (narrow gage).

Train load -----400 short tons of cargo
(20 cars at about 20
tons each) or 1,000
troops (40 boxcars at
25 troops each).

- (2) *Narrow gage* (36 in., 39 $\frac{3}{8}$ in., and 42 in.).

Single track -----10 trains (3,000 short
tons) per day in each
direction.

Train load -----300 short tons of cargo
(20 cars at about 15
tons each) or 500 troops
(20 boxcars at 25 troops
each).

f. Highways.

- (1) Highway tonnage capability.^{2 3}

Dirt -----1,600 short tons/day fwd

Gravel -----3,400 short tons/day fwd

Bituminous -----7,300 short tons/day fwd

Concrete -----8,400 short tons/day fwd

- (2) A hard-surface, two-lane road of high-type asphalt, macadam, or equivalent will support a corps of four or five divisions.

- (3) Trucks required to move the foot troops of an infantry division—219 vehicles less any available vehicles from the infantry division transportation battalion.

- (4) A transportation light truck company (TOE 55-17) equipped with 2 $\frac{1}{2}$ -ton, 6 x 6, cargo trucks is capable of mov-

ing 720 short tons of general cargo for local hauls daily or compiling 18,000 forward ton-miles daily on line or long hauls (based on 75 percent vehicle availability, 4 tons per vehicle, 100-mile haul).

- (5) A transportation light truck company (TOE 55-17) equipped with 5-ton, 6 x 6, cargo trucks is capable of moving 1,080 short tons of general cargo for local hauls daily or compiling 27,000 forward ton-miles daily on line or long hauls (based on 75 percent vehicle availability, 6 tons per vehicle, 100-mile haul).

g. Pipelines. For pipeline transfer and movement capabilities, see TM 5-350.

h. Air Transportation. For aircraft requirements to transport the infantry division or the airborne division and organic units thereof by air, see FM 7-100 or FM 57-100, respectively.

² No exact formula has been developed for determining the capabilities of various types of roads and highways because of many variable factors which must be considered. These capabilities are based on the following assumptions:

- Operation is sustained.
- Necessary road maintenance is performed.
- Each road bears two lanes of traffic, permitting movement in both directions.
- Standard cargo trucks, 2 $\frac{1}{2}$ -ton, 6 x 6, are used.
- Two-thirds of the capability of the road is used for civil and/or other military traffic normal to a theater of operations.

³ Reductions for width, alignment, and weather have not been applied. See paragraph 7.14.

Section II. TERMINALS

7.5. General

a. Types. A terminal is either end of a carrier line, such as a railroad, trucking line, shipping line, or airline. It normally includes servicing, repair, and maintenance facilities; classification yards; dock and lighterage facilities; management offices; storage facilities; and freight and passenger loading and unloading facilities as required. The three types of terminals treated in this section are—

- Water terminals.
 - Ports.
 - Beaches.
- Inland terminals.
- Air terminals.

b. Elements of Terminal Planning. There are normally five steps in terminal planning:

- Step 1.* Computation of the terminal workload required to support the operation, expressed as cargo tonnage and number of personnel per day.
- Step 2.* Estimation of the existing terminal capacity, which is the total tonnage and personnel that can be received, processed, and cleared through the terminal in a day.
- Step 3.* Estimation of construction requirements, which are the requirements for repair and rehabilitation of existing facilities and construction of

new facilities necessary to increase the existing terminal capacity to equal the required terminal workload.

- (4) *Step 4.* Estimation of the equipment requirement, which is the amount of equipment needed to process the required workload through the terminal with the maximum efficiency.
- (5) *Step 5.* Estimation of the personnel requirements, which are the units and individuals needed for administration and operation in processing the required workload through the terminal.

7.6. Water Terminals (Ports)

a. General. This paragraph deals with planning data for water terminals in the hands of the enemy, but which are to be opened for operation as soon as cleared. For this reason, data are based on the employment of Army personnel and ships' gear only for the unloading of ships. Appropriate allowances should be made for other circumstances, such as availability of civilian labor and terminal facilities; i.e., gantry cranes, barges, railway, etc. Discharge of dry cargo from ships will be accomplished by one of two methods—either from vessels alongside a wharf onto the wharf or by lighters from a vessel anchored astream. Petroleum tankers will be discharged at wharfside or offshore by means of submarine pipelines. Throughout the discussion of water terminals in this paragraph, the basic period of time is a 20-hour day. This is generally considered to be a complete round-the-clock working day in terminal operations, the other 4 hours of the day being taken up in delays inherent in the work, such as break-

downs, waiting for trucks, changing shifts, and meals. (For planning of terminal discharge in forward areas when enemy action may be expected to cause work delays, 15 hours' working time per day may be estimated. Factors used may be reduced proportionately.) For general planning purposes, the transportation terminal service company is considered capable of discharging 720 short tons per 20-hour working day.

b. Water Terminal Capacity Estimation.

- (1) *Factors.* Terminal throughput capacity is determined by three major factors. In all instances, one of these will be the limiting and thereby determining factor. Each of the three factors may be expressed in terms of short tons per day for planning and estimating purposes. All three factors should be accurately estimated even though the limiting factor may be obvious. These estimates will serve to indicate the facilities where improvement effort will yield the greatest return in terms of tonnage movement capability. The three major factors are—
 - (a) Terminal reception capacity; that is, the ability to move ships into the harbor of coastal area of the terminal.
 - (b) Terminal discharge capacity; that is, the ability to accommodate ships in the harbor and to discharge them.
 - (c) Terminal clearance capacity; that is, the ability to accomplish terminal clearance.

(2) Checklist for water terminal capacity estimation.

Collect and evaluate these data	Compute these factors	Determine this figure
1. Channel depths..... 2. Obstructions..... 3. Enemy air activity..... 4. Enemy surface activity..... 5. Enemy submarine activity..... 6. Climate..... 7. Weather..... 8. Minefields or contaminated areas..... 9. Our own capabilities in combating obstacles.....	(a) Evaluate to determine:	A. Water terminal reception capacity:
1. Tactical dispersion requirements..... 2. Wharf facilities..... 3. Beach capabilities..... 4. Discharge rates ashore..... 5. Discharge rates astream..... 6. Anchorage area..... 7. Extent of destruction or contamination..... 8. Climate and seasons..... 9. Weather and tide characteristics..... 10. Cargo-handling equipment available..... 11. Floating craft and equipment available..... 12. Transit sheds and areas..... 13. Availability of indigenous labor..... 14. Space reserved for local economy..... 15. Enemy activity.....	(b) Evaluate to determine:	B. Water terminal discharge (input) capacity.
1. Capacity of rail facilities..... 2. Capacity of highway facilities..... 3. Capacity of inland waterway facilities..... 4. Capacity of pipeline facilities..... 5. Capacity of air facilities..... 6. Enemy activity.....	(c) Add to determine:	C. Water terminal clearance (output) capacity.

Water terminal throughput capacity.

(a) These data will probably be obtained from Navy sources; also see paragraphs 7.48 through 7.55.

(b) For information on beaches, see paragraph 7.7.

(c) Capabilities of transport services—pipeline, inland waterway, rail, highway, air transport—are indicated in paragraphs 7.10 through 7.27, and 7.41 through 7.47.

c. Wharf Facilities.

(1) *General.* Since only two methods of dry cargo discharge are available (a above), general planning must consider wharf facilities for alongside and lighter discharge. The Victory-type ship having five hatches is used as a basis for all discharge. It was selected since it so closely meets the average characteristics of a nominal ship. Deep-draft wharfage must be

provided whenever *alongside* discharge is contemplated. Shallow-draft wharfage and anchorage areas must be given joint consideration when lighter discharge is contemplated. Factors governing wharfage will be found in (2) and (3) below. The term *wharf* is used throughout in its general meaning; i.e., a structure used to aid in the berthing, loading, and discharge of a vessel. Specific definitions of ship berthing facilities are as follows:

- (a) *Wharf.* A wharf is a projecting platform of timber, stone, or other material which extends into water deep enough for vessels to be accommodated alongside for loading or unloading.
- (b) *Quay.* A quay is a wharf parallel with the shoreline of a basin or

harbor with water and accommodations for ships on one side only.

- (c) *Pier.* A pier is a wharf which projects into the harbor or basin with water and accommodations for ships on both sides.
- (2) *Deep-draft wharf requirements.* A wharf is classified as deep-draft when the water alongside is deep enough to permit a fully loaded ship to tie up alongside. The following criteria will govern:
 - (a) *Water depth.* Water depth should be not less than 30 feet at low tide. A minimum of 30 feet is used for planning purposes since this will accommodate virtually all deep-draft vessels.
 - (b) *Length for Victory-type ship, 500-feet.* Each hatch (five per vessel) will require 100 feet of wharf. When wharfs are over 500 feet long and less than the next higher 500-foot unit, the odd footage is disregarded in determining the number of berths available (that is, 1,200 feet will accommodate only two ships at the same time). However, the extra 200 feet can be considered for lighterage use ((3) below).
 - (c) *Width.* Width should be 60 to 90 feet for discharge on 1 side of wharf only; 90 feet and up for discharge on both sides of wharf. For planning and estimating purposes, a wharf should be 60 to 90 feet wide to allow sufficient working space to discharge cargo from a ship. In the case of a pier where two vessels can tie up at the same time, one on each side, it is recommended that the width be 90 feet or more for efficient discharge.
- (3) *Lighterage wharf requirements.*
 - (a) *General.* Any wharf may be used for lighter discharge if the water depth is sufficient for the type of lighterage being used. It may in-

clude wharfage that dries out at low tide but which can be used half the time, or 10 hours per day.

- (b) *Length for lighter.* Wharfage length for a lighter should be 100 feet. Length of wharfage over 100 feet and less than the next higher 100-foot unit is disregarded (that is, a 350-foot wharf will handle three lighters at the same time).
 - (c) *Width.* A minimum of 35 feet is recommended for discharge on one side; 42 feet for discharge on both sides of pier.
- d. *Discharge Rates.*
- (1) *Per ship berth (Victory-type).* Seven hundred twenty short tons per 20-hour day (five hatches at 7.2 short tons per hatch per hour).
 - (2) *Per lighter berth.* One hundred eighty short tons per 20-hour day (1.8 short tons per linear foot of wharf per 20-hour day).
 - (3) *Per roll-on/roll-off berth (Comet-type).* One thousand short tons of cargo loaded in semitrailers per hour.
- e. *Anchorage Areas.* Anchorage areas are defined as shelter areas inside or near a harbor, unaffected by swell, where ships may anchor and discharge by lighter.
- (1) *Depth.* Minimum, 30 feet; maximum, 210 feet. The minimum depth is dictated by the draft of the ship, and the maximum by the length and weight of the anchor chain. Installed facilities, such as mooring buoys, may modify maximum depth limitations.
 - (2) *Free-swinging anchorage area.* Eight-hundred-foot radius circle.
 - (3) *Moored bow and stern.* Variable; this method is not preferred since it can be used only in areas unaffected by tidal currents.
- f. *Estimate of Water Terminal Operating Personnel and Equipment.*
- (1) *General.* To insure maximum efficiency in terminal operations, a balanced operating force and suitable equip-

ment must be available. Extreme care must be exercised during both the planning phase and actual operating phase to insure that a balance is established and maintained. The possibility of using civilian and prisoner of war labor should not be overlooked, particularly in later expansion of the water terminal.

- (2) *Operating personnel.* Operating personnel are divided into managing, or supervisory, elements (such as headquarters and headquarters company, terminal commands A, B, or C) and functional operating units. In this last category may be included terminal service companies or battalions, truck companies, engineer units, harbor craft units, and such other units particularly suited for the functioning of any particular water terminal. Units commonly found in a water terminal are listed below:

Headquarters and headquarters company, transportation terminal command C (TOE 55-111).

Headquarters and headquarters company, transportation terminal command B (TOE 55-121).

Headquarters and headquarters company, transportation terminal command A (TOE 55-131).

Headquarters and headquarters detachment, transportation terminal battalion (TOE 55-116).

Transportation terminal service company (TOE 55-117).

Headquarters and headquarters company, transportation boat battalion (TOE 55-126).

Transportation light boat company (TOE 55-127).

Transportation medium boat company (TOE 55-128).

Transportation heavy boat company (TOE 55-129).

Transportation amphibious truck company (TOE 55-137).

Transportation floating craft depot maintenance company (TOE 55-157).

Headquarters and headquarters detachment, transportation truck battalion (TOE 55-16).

Transportation light truck company (TOE 55-17).

Transportation medium truck company (TOE 55-18).

Transportation heavy truck company (TOE 55-28).

Transportation aerial tramway company (TOE 55-187).

Floating craft crews (TOE 55-500).

Transportation staging area company (TOE 55-147).

Military police battalion (TOE 19-55).

Engineer utilities team (TOE 5-500).

Engineer firefighting team (TOE 5-500).

Finance disbursing section (TOE 14-500).

Medical dispensary team (TOE 8-500).

Veterinary food inspection detachment (small) (TOE 8-500).

Quartermaster service company (TOE 10-67).

Signal service team (TOE 11-500).

Army postal unit (TOE 12-605).

Ordnance ammunition team (TOE 9-500).

g. Special Cargo-Handling Equipment. Requirements for general planning purposes to handle 720 short tons of general cargo daily into an established terminal or beach operation or to load 500 short tons of general cargo daily are as follows:

1	2	3	4	5	6	7	8	9
		Forklifts						
	Cranes	4,000-lb load	8,000-lb load, rough terrain	10,000-lb load, rough terrain	15,000-lb load, rough terrain	Stevedore gear sets	Lighters	Conveyors
Transportation terminal service company TOE 55-117. ¹	3 10-ton 1 40-ton 2 20-ton	5	5	4	2	7 ea cgo set, general hatch. 1 ea of 8 sp cgo sets.	12 lighters or 4 LCU; or 12 LCM.	20 sections (10-ft) and 5 curves.

¹ Items shown in columns 2 through 7 and 9 are authorized in TOE 55-117.

h. Operating Equipment. Equipment necessary for terminal operations can be separated into two categories:

- (1) *The first category*, equipment directly employed in ship discharge and cargo movements, includes such items as cranes, forklift equipment, trucks, tractors, harbor craft, lighters, railway engines and cars.
- (2) *The second category*, equipment supporting the terminal operations, includes all maintenance utilities, power generators, repair shops.
- (3) For details of operation and capacity of terminal operating equipment, see the following references:

FM 55-51, *Transportation Terminal Commands, Theater of Operations.*

FM 55-52, *Transportation Terminal Battalion and Terminal Service Company.*

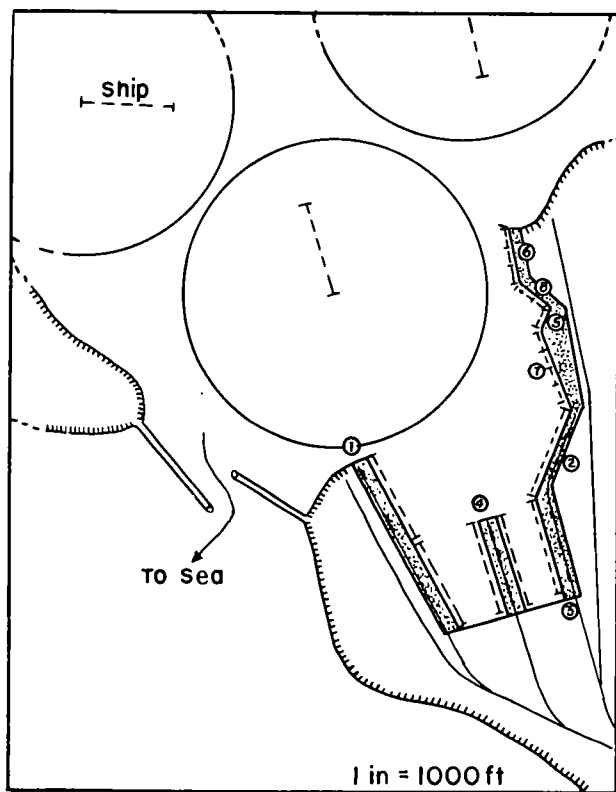
FM 55-53, *Transportation Amphibious Truck Company.*

i. Illustrative Example of Water Terminal Capacity Estimation. The following example has been provided to demonstrate the recommended procedure for water terminal capacity estimation based on the steps and data outlined in the preceding paragraphs.

- (1) *Situation.* A true-scale chart of a certain harbor has been prepared for evaluation. With reference to this chart, the following additional information has been assembled:

1	2	3	4
Wharf No.	Length (ft)	Width (ft)	Minimum depth alongside at low tide (ft)
1.....	1,060	80	32
2.....	490	60	30
3.....	580	90	30
4.....	535	100	34 ea side
5.....	125	54	8
6.....	295	60	15
7.....	450	75	22
8.....	210	60	16

- (a) There is sufficient area inside the harbor to anchor three ships as shown, where they can be worked continuously.
- (b) In good weather, as many as two vessels can be anchored and worked outside the breakwater.
- (2) *Problem.* To estimate the daily capacity of this terminal during ideal weather.



¹The situation shows wharf 6 to be only 295 feet long. The criterion for lighter wharfage, as given in c above, limits this wharf to two lighters. However, since the 5-foot shortage will limit operations to no appreciable extent, it is feasible to use the 95-foot section for docking a third lighter. This has been done here.

- (c) *Rate of discharge from ships at anchor to lighters.* From the situation, three ships can be anchored inside the breakwater and two can be anchored and worked outside the breakwater in good weather. Therefore, in good weather, cargo can be discharged from ships to lighters at the rate of $(3 + 2) \times 720 = 3,600$ short tons per day.
- (d) *Resultant daily terminal capacity—summary.*

1. Discharged alongside deep-draft wharfs—4,320 short tons per day.
2. Discharged from lighters to wharf—1,800 short tons per day.
3. Transferred from ships to lighters—3,600 short tons per day.
4. Therefore: 1,800 short tons per day is maximum discharge by lighter since lighter wharfage is the limiting factor in this case.
5. Total daily terminal capacity: 4,320 short tons per day alongside. 1,800 short tons per day by lighter.

Total 6,120 short tons per day.

- (e) *Limitations on terminal capacity.* Requirements for dispersion and limitations on the number of ships which can be grouped in one area may restrict the use of the facility to much less than its full capacity.

- (4) *Effects of bad weather.* Advance study must be made to determine the probable effect of bad weather on rate of discharge and other factors in water terminal capacity. Continuous records of daily discharge plotted against weather and surf conditions prove valuable in planning future discharge in the same and similar water terminals.

- (5) *Operating personnel and equipment.* Note that appropriate amounts of op-

(3) *Solution.*

(a) *Discharge tonnage at deep-draft wharfage.*

1	2	3
Wharf No.	Vessels which can be berthed	Rate of discharge in short tons per day
1.....	2 Victories	$2 \times 720 = 1,440$
2.....	1 Victory	$1 \times 720 = 720$
3.....	1 Victory	$1 \times 720 = 720$
4.....	2 Victories	$2 \times 720 = 1,440$
Total.....		4,320

(b) *Discharge tonnage to lighterage wharfs.*

1	2	3
Wharf No.	Lighter berths	Rate of discharge in short tons per day
5.....	1	$1 \times 180 = 180$
6.....	3	$3 \times 180 = 540$
7.....	4	$4 \times 180 = 720$
8.....	2	$2 \times 180 = 360$
Total.....		1,800

erating personnel and equipment must be provided to use the capacities of the physical facilities of the terminal.

7.7 Water Terminals (Beaches)

a. Amphibious Operations.

(1) Beach capacity.

- (a) Each landing in an amphibious operation differs as to climatic and hydrographic conditions and variations in topographic features, as well as in the military situation. These variable factors make it impracticable to develop detailed logistical planning data applicable only to beaches and their capacity to receive troops and cargo. However, certain general planning data can be developed.
- (b) Beach capacity is an evaluation of cargo quantities that can be discharged over a given lineal beach length within a stated interval of time. During the initial phases of an amphibious operation, beach capacity will be limited to the beach (or beaches) over which the assault landing is made; later, if necessary, overall capacity may be increased by the consolidation of beaches for more efficient operation and for the opening of sheltered unloading points in rivers or bays. Experience has indicated that, during the *assault* phase of an operation, cargo can be landed and moved across beaches as follows (use either 1 or 2 or 1 and 2 together in proportionate combination):

1. Average short tons of cargo per day per mile of beach ----- 3,000
(Average per ,000 yards of beach ----- 1,700)
2. Average numbers of vehicles and personnel landed simultaneously per day per mile of beach:
Vehicles ----- 675
Personnel ----- 4,725

(2) Ship-to-shore supply service. A ship-

to-shore supply service will include the following:

- (a) Unloading cargo from ships into landing craft or landing vehicles.
 - (b) Movement of cargo by landing craft or landing vehicles from ships to shore.
 - (c) Unloading of landing craft at beaches.
 - (d) Movement of cargo from beaches to beach dumps, transfer points ashore, and shore-based dumps.
 - (e) Unloading at dumps or transfer points.
- (3) *Requirements for ship unloading.* Facilities for unloading ships offshore are usually limited to the ships' organic gear. Using organic ships' gear, stevedore labor, and lighterage provided by the task force, cargo is discharged at a prescribed rate in planned sequence. The use of balanced amounts of conventional and amphibious ship-to-shore lighterage, combined with planned and controlled ship-discharge, will reduce beach congestion to a minimum.
- (4) *Characteristics of amphibious force vessels and craft.*
- (a) Data contained in this paragraph with reference to speed and endurance may vary under operational conditions.
 - (b) Designating letters and names are used in the following general manner:
 1. LC (landing craft) is applied to nonocean-going vessels of less than 200 feet overall length designed for landing operations.
 2. LS (landing ship) is applied to ocean-going vessels of more than 200 feet overall length designed for participation in landing operations.
 3. LV (landing vehicle) is applied to small equipment designed for landing operations and capable of use on land or water.

(c) Characteristics of small landing craft.

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Name	Symbol	Length	Beam	Capacity		Draft (loaded)		Speed loaded (knots)	Range (miles)	Crew	Weight (LTONS) empty	Cargo space dimensions
					Troop	Cargo (LTONS)	Forward	Aft					
2	Landing craft, vehicle, personnel.....	LCVP	36' 0"	10' 5"	36 or	3.5	2' 2"	3' 0"	10.5	135	4	8	17' 3" x 7' 5" x 5'
3	Landing craft, mechanized (Mark VI).	LCM(6)	56' 0"	14' 0"	120 or	32.0	3' 0"	4' 8"	8.0	128 at 8 knots	4	28	37' 6" x 11' 0" x 6' 4"
4	Landing craft, mechanized (Mark VIII).	LCM(8)	73' 8"	21' 0"	200 or	53.5	3' 0"	5' 0"	10.0	284	6	60	42' x 14' 6" x 3' 8"
5	Landing craft, utility (1466 class)....	LCU	115' 1"	34' 0"	300 or	135.0	3' 1"	4' 0"	7.0	700	12	180	52' x 26' 9" x 4' 6" plus
6	Landing craft, utility (1610 class)....	LCU	135' 3"	29' 0"	400 or	170.0	3' 3"	6' 6"	11.0	-----	12	174	22' x 14' 4" x 4' 6" plus 27' x 27' x 4' 6" plus 53' x 18' x 4' 6" plus 14' x 20' x 4' 6" plus 11' x 13' x 4' 6"

(d) Characteristics of amphibious vehicles.

1	1	2	3	4	5	6	7	8	9	10	11
	Name	Symbol	Length	Beam	Capacity		Speed L—land —MPH W—water —knots	Range (miles) L—land W—water	Crew	Weight (LTONS) empty	Example of material carried
					Troop	Cargo (LTONS)					
2	Carrier, cargo, amphibious, full-tracked.	M29C	14' 5 $\frac{11}{16}$ "	5' 7 $\frac{1}{4}$ "	4	or 0.2	32L 3.4W	175L 45.2W	2 to 4	1.7	Light cargo or personnel.
3	Carrier, personnel, full-tracked, armd.	M59	17' 11"	10' 8 $\frac{1}{2}$ "	11	or 1.5	32L 4.3W	120L —W	1	17.3	Personnel or light cargo.
4	Carrier, cargo, amphibious, full-tracked.	M76	15' 7"	8' 2"	10	or 15.0	28L 3.4W	160L 24.6W	2	4.3	10 passengers (including crew).
5	Landing vehicle, tracked (Mark V)...	LVTP-5	29' 8"	11' 8 $\frac{1}{2}$ "	34	or 9L 6W	27.8L 6.7W	187L 45W	3	31.2	105-mm howitzer W crew and 100 rd ammo.
6	Landing vehicle, tracked, (armored) (Mark V).	LVT(A)-5	27' 2 $\frac{1}{2}$ "	10' 10"	-----	-----	20L 5.6W	150L 50W	5	15.7	None.
7	Landing vehicle, tracked (Mark VI).	LVTH-6	29' 8"	11' 8 $\frac{1}{2}$ "	-----	-----	27.8L 6.7W	187L 45W	6	37.8	None.
8	Landing vehicle, tracked (Mark VI).	LVTP-6	21' 7"	10' 9"	20	or 5L 4W	35L 5.5W	190L 45W	3	17.9	Bulk cargo.
9	Mortar, 4.2-inch, self-propelled, full-tracked.	M84	18' 5"	10' 4"	6	or 1.6	30L 3.8W	90L —W	6	23.15	Mortar, 4.2-in.
10	Truck, amphibious, 2 $\frac{1}{2}$ -ton, 6 × 6...	Amph trk	31' 0"	8' 3"	25	or 2.2 to 4.0	50L 5W	240L 25W	2	7.5	One 105-mm howitzer.
11	Lighter, amphibious, 60-ton, design BARC.	BARC	62' 6 $\frac{3}{4}$ "	26' 7"	125 (normal) 200 (emerg)	53.6 (normal) 89.3 (emerg)	14L 7W	210L 105W	8	87.0	Heavy, bulky equipment.

Note. No consideration need be made for the draft of amphibious vehicles. However, consideration must be given to the characteristics of the landing area which may affect beaching, such as mud, coral or rock formations.

(e) Characteristics of landing ships.

i	1	2	3	4	5	6	7	8	9	10	11	12
	Name	Number ships in class	Type	Operational range (nautical miles)	Cargo capacity (LTONS)	Troop capacity ¹	Cargo space (sq ft)	Loaded draft		Length	Boat capacity	Typical loads
								Beaching	Oceangoing			
2	LSD(1)----	26	Flooded well deck.	13,000	1,233	226	17,316	27'0" (flooded).	18'0" (dry)	458'0"	2 LCVP and 1 LCPL.	3 LCU and 4-5 med trk; or 18 LCM(6) and 30 LTON cargo; or 41 LVT; or 27 LCVP; or 47 DUKW; or 44 M48 tk.
3	LSD(28)---	1	Flooded well deck.	13,000	2,410	353	19,800	30' 0" (flooded).	19' 0" (dry)	510' 0"	3 LCVP and 1 LCPL.	(With two temporary decks W ramps) 92 LVT or 108 DUKW.
4	LSD(32)---	4	Flooded well deck.	9,500	2,500 in addition to rated well-deck load.	313	24,792	33' 9" (flooded).	19' 0" (dry)	510' 10"	3 LCVP and 1 LCPL.	3 LCU; or 20 LCM(6); or 9 LCM(8); or 49 LVTP-5; or 87 LVTP-6.
5	LST (1156).	15	Ramp, 50-ton capacity.	6,000	Normal—446; Maximum landing—803; Full—1,395.	395	14,000 (vehicles) 16,500 (cargo)	4' 11" fwd 10' 8" aft	8' 3" fwd 14' 0" aft	382' 0"	3 LCVP and 1 LCPL.	80 2½-ton trk, 450 LTON cargo; or 144 ¾-ton trk, 415 LTON cargo; or 233 ½-ton trk, 530 LTON cargo; or 54 DUKW, 445 LTON cargo.
6	LST (1153).	2	Steam-driven; ramp, 50-ton capacity.	7,700	Normal—446; Maximum landing—803; Full—2,060.	197	14,340	3' 11" fwd 11' 11" aft	9' 6" fwd 16' 3" aft	382' 0"	4 LCVP or 4 LCPR.	21 LVT and 35 2½-ton trk; or 226,000 gal gasoline and 70,000 gal diesel fuel.
7	LST(542)---	148	Ramp, 50-ton capacity.	7,706	Normal—446; Maximum beaching—803; Full—1,212.	141	4,556 (vehicles) 9,772 (cargo)	5' 3" fwd 10' 2" aft	7' 2" fwd 13' 0" aft	328' 0"	4 LCVP or 4 LCPR.	26 2½-ton trk, 650 LTON cargo; or 46 ¾-ton trk, 675 LTON cargo; or 75 ¼-ton trk, 710 LTON cargo; or 17 DUKW, 685 LTON cargo.
8	LST (1171).	8	Ramp, 75-ton capacity (equipped W turntable).	6,048	Normal—500; Maximum landing—900; Full—1,850.	634	18,313	4' 0" fwd 13' 0" aft	9' 9" fwd 16' 0" aft	442' 0"	3 LCVP and 1 LCPL.	19 LVTP-5 and 5 H-19 hel; or 27 LVTP-6 and 5 H-19 hel; or 49 DUKW; or 69 2½-ton trk; or 42 2½-ton trk W 1½-ton trl; or 42 M48 tk.
9	LSM-----	136	Ramp, open well.	10,000	Landing—147; Full—446.	56	2,900	3' 6" fwd 7' 1" aft	6' 4½" fwd 8' 5" aft	204' 0"	-----	3 M48 tanks; or 5 LVT; or 9 DUKW.

See footnotes on page 392.

¹Troop capacity may be increased by berthing troops on decks. Troops must provide own feeding facilities.

²Add 6,336 sq ft with mezzanine deck installed.

Notes 1. A boat space is the space weight allowed one soldier with his individual combat equipment. It is 224 pounds or 13.5 cubic feet. When computing boat spaces required for cargo, use either the weight or the space occupied, whichever is greater. Hand carts, loaded or empty, require two boat spaces.

2. Running time may be computed from the formula $T = \frac{3D}{S}$, when D = Distance run in hundreds of yards.
 S = Speed in knots ($1\frac{1}{2}$ MPH).
 T = Running time in minutes.

(f) Characteristics of transport-type vessels.

	1	2	3	4	5	6	7	8	9	10	11
1	Name	Number ships in class	Class	Type	Length	Loaded draft	Troop capacity	Cargo capacity (LTON)	Cargo space	Boat capacity	Cruising range (nautical miles)
2	Amphibious force flagship (AGC).....	16	-----	C-2	459'	24' 0"	-----	-----	-----	2 LCVP 4 LCPL 2 LCPR	30,000
3	Attack transport (APA 117).....	57	Haskell	-----	455'	24' 0"	1,565	446.0	13,000 sq ft	2 LCM(6) 22 LCVP	9,800
4	Attack transport (APA 33).....	6	Bayfield	-----	492'	27' 0"	1,647	446.0	110,000 cu ft	1 LCPL 1 LCPR	11,630
5	Attack cargo ship (AKA).....	35	Montague	C-2A	459'	24' 0"	212	1,335.0-1,600.0	15,000 sq ft	4 LCM(6) 18 LCVP	12,000
6	High-speed transport (APD).....	21	-----	EX-DDE	306'	13' 0"	156	45.0	160,000 cu ft	3 LCPL 2 LCPR	5,100
7	Transport submarine (ASSP).....	2	Sea Lion	-----	312'	-----	85	26.7	31,858 sq ft	6 LCM(6) 14 LCVP	-----
8	Roll-on/roll-off vehicle ship (T-AK).....	1	Comet	C-4	449'	22' 0"	-----	4,000.0 (375 veh)	291,706 cu ft	1 LCPL 1 LCPR 2 LCM(3) 2 LCVP 2 LCPR or 2 LCPL	13,000
9	Amphibious assault ship (LPH).....	13	-----	EX-CVE	88'	28' 9 $\frac{1}{4}$ "	1,500	-----	60,000 sq ft parking space and 176,500 cu ft cargo space.	20 rubber landing craft.	16,000

- (5) *Cargo movement by amphibious trucks.* In amphibious operations, amphibious trucks are specialized equipment of exceptional value which enable direct movement of cargo from ships to shore-based dumps. Experience indicates that amphibious trucks are capable of movement of 720 short tons per company per day for overall in-and-out of water operations. This factor may be used for general planning purposes.
- (6) *Equipment required for operations on the beach, for beach clearance, and for operations in shore-based dumps.* World War II experience consistently showed a lack of sufficient shore-based equipment to receive cargo as rapidly as unloading from ships could be effected. Resulting bottlenecks at beaches and at beach dumps could have been avoided had additional cargo-handling equipment, particularly cranes, been available. It was found that cargo-handling equipment best adapted to beach and shore dump employment included cranes, tractors, and trucks. Detailed characteristics of these items are outlined below.
 - (a) Cranes should be self-propelled, of medium and heavy types, with booms 40 feet in length to permit lifting filled cargo nets. Each crane can handle discharge from 3 LCU's, or 8 LCM's, or 12 LCVP's under normal beach operations when sufficient trucks or tractors are available to haul or drag away unloaded cargo.
 - (b) Medium and heavy tractors, on an average, can tow two loaded sled pallets. This type of movement from beach to dump is slow and less satisfactory than movement by truck. However, for dragging pallets from landing craft and within supply dumps, tractors are effective. Tractors are invaluable for clearing the beach and dump areas of mired

vehicles. Eight to 10 tractors per assault division, 6 to 7 on beaches, and 2 to 3 in supply dumps are usually sufficient. Several tractors assigned to a beach should be equipped with angledozers.

- (c) See paragraphs 7.10 through 7.14 regarding trucks.
- (7) *Beach service troop requirements.* Service troops are employed throughout the supply-service cycle from ship unloading to segregation and storage of supplies in shore-based dumps. The multiple functions performed in this cycle require that care be exercised in balancing the type of troops employed, since a breakdown in service troops' functioning will render available equipment partially or completely ineffective.
 - b. *Logistical-Over-the-Shore (LOTS) Operations.*
 - (1) *General.* A LOTS operation provides, in situations other than amphibious operations, for the movement of cargo across the shore between ocean transportation and shoreside facilities. Beaches and other more difficult shoreline will be utilized during this type of operation to the extent required by the situation.
 - (2) *Beach capacity estimation.* The checklist contained in paragraph 7.6b(2) may be used to assist in determining the beach capacity. Certain of these factors are not primary considerations, and others must be greatly expanded according to the location under study, which will determine the weight to be given each individual factor. The following items must be investigated thoroughly to determine their effect on the operation:
 - (a) Weather—wind, fog, rainfall, temperature.
 - (b) Sea area—extent, depth of water, type bottom, vulnerability to sea-wave action.
 - (c) Beach approaches—reefs, bars,

manmade obstacles, tide, type of bottom, surf conditions, underwater gradient.

(d) Beach—gradient, composition, length, width, wave effect, exits.

(e) Hinterland—depth, concealment, transportation net capability.

(3) *Operating equipment.* The same materials-handling functions are performed as in a conventional port situation (par. 7.6h), but there is a greater requirement for cranes, and forklift trucks must be able to traverse sand and soft terrain. Amphibians should be used to relieve congestion at the water's edge and eliminate unnecessary handling of cargo.

7.8. Inland Terminals

a. *Definition.* Inland terminals are defined as those inland transit points where cargo is—

Collect these data when applicable

1. Channel depths.....
2. Obstructions.....
3. Capacity of rail facilities.....
4. Capacity of highway facilities.....
5. Capacity of pipeline facilities.....
6. Capacity of air facilities.....
7. Enemy air activity.....
8. Enemy surface activity.....
9. Climate.....
10. Weather.....
11. Contaminated areas.....
12. Our own capabilities in combating obstacles.....
1. Tactical dispersion requirements.....
2. Wharf and/or platform facilities.....
3. Discharge rates.....
4. Unloading rates.....
5. Loading rates.....
6. Extent of destruction or contamination.....
7. Climate and seasons.....
8. Weather and tide characteristics.....
9. Materials handling equipment available.....
10. Cargo handling equipment available.....
11. Floating craft and equipment available.....
12. Airfield capabilities.....
13. Transit sheds, yards, and areas.....
14. Indigenous labor available.....
15. Space reserved for local economy.....
1. Capacity of rail facilities.....
2. Capacity of highway facilities.....
3. Capacity of inland waterway facilities.....
4. Capacity of pipeline facilities.....
5. Capacity of air facilities.....

Compute these factors

Determine

- (1) Temporarily held intransit awaiting disposition instructions.
- (2) Transferred from one means of transportation to another.
- (3) Broken down from bulk shipments and reshipped in small units.
- (4) Collected from other points to make a transportation unit for reshipment.

b. *Capacity Estimation.* Inland terminal capacity is the total tonnage that can be *received*, *processed*, and *cleared* through the terminal in any 1 day. The terminal capacity is estimated by analyzing three major factors—reception capacity, loading and unloading or transfer capacity, and clearance capacity—to ascertain which is the limiting factor, and then determining its value as expressed in daily tonnage. The following is a checklist for estimation of inland terminal capacity:

- (1) Evaluate to determine:
A. Inland terminal reception capacity.

- (2) Evaluate to determine:
B. Loading and/or unloading or transfer capacity.

- (3) Add to determine:
C. Clearance capacity.

Inland terminal capacity.

c. Estimation of Equipment. Equipment requirements are determined by analyzing the projected workload of the inland terminal in relation to the tonnages and types of cargo to be unloaded, loaded, and transferred. See paragraphs 7.6*g* and *h* for planning data on cargo-handling equipment.

d. Estimation of Personnel Requirements. Personnel requirements are determined by evaluating the mission of the inland terminal in terms of workload, equipment to be manned, and services to be performed. To insure maximum efficiency in terminal operation, a balanced force and supervisory elements must be available. The use of indigenous and prisoner-of-war labor should be considered.

7.9. Air Terminals

a. General. Air terminals provide facilities for loading and unloading aircraft and for in-transit handling of personnel and cargo which are moved by aircraft.

b. Responsibilities.

- (1) *Air Force.* Selection, preparation, and operation of air terminals, exclusive of airfields or landing areas operated by and for Army aviation units.
- (2) *Army.* Engineer service support of air terminals, to include construction and maintenance other than repairs and utilities.

c. Operations.

- (1) *General.* The theater air force provides aerial port squadrons to operate air terminals. Theater army may establish facilities and station personnel at an air terminal in a tenant status to perform those functions agreed upon by the theater army and theater air commanders.
- (2) *Aerial port squadrons.* An aerial port squadron is a cellular-type Air Force organization. Its utilization and its strength are determined by the assigned mission. These units provide passenger and cargo-handling capabilities, to include manifesting, warehousing, loading, unloading, tiedown, preparation for aerial delivery, and

ejection in flight. One aerial port squadron is capable of performing any one of the following tasks:

- (a) Handling 480 tons of cargo per 8-hour day in an air-landed operation.
- (b) Rigging for delivery by parachute and loading 280 tons of cargo per 8-hour day when the packing of parachutes is not required.
- (c) Rigging for delivery by parachute, packing parachutes, and loading 112 tons per 8-hour day.
- (3) *Army quartermaster aerial supply companies (TOE 10-407).* These units are stationed at selected air terminals or at Army logistical installations to prepare cargo for parachute or free-drop delivery. For capabilities of this company, see TOE 10-407, FM 101-10, part II.
- (4) *Volume.* The volume of cargo and passenger traffic at an Army airfield may require assignment of a unit to perform these operations. Units which may be employed include the quartermaster aerial supply company or teams from TOE 10-500; transportation terminal service company (TOE 55-117); or terminal service teams from TOE 55-500.

d. Airfield Capabilities.

- (1) The following criteria establish the maximum number of aircraft which can be based on an airfield or landing strip. Dispersion requirements may dictate decreased utilization of such facilities.
 - (a) Improved airfields in rear of combat zones can serve as a base for a maximum of two wings. Under ideal conditions, aircraft land or takeoff at 3-minute intervals, and 1 hour on the ground is required for each landing for necessary servicing, re-loading, and inspection.
 - (b) Unimproved airfields and landing strips in rear of the combat zone can serve as a base for approximately one wing.

- (c) Transport aircraft normally will not be based in the combat zone. On airfields in the combat zone, aircraft land or takeoff at 3-minute intervals under ideal conditions, and the time required on the ground is reduced to 30 minutes. Service and maintenance is limited to emergency requirements only, and the tactical situation normally will not permit more time than that required for

- actual unloading and reloading.
- (2) For transport aircraft use, airfields in rear of the combat zone should be considered operational both day and night. Airfields in the combat zone may be operational only during daylight hours, depending on the enemy air capabilities.
- (3) The capabilities of aerial port squadrons also influence traffic potential of airfields.

Section III. HIGHWAY TRANSPORT

7.10. Highway Transport Operations

a. Operations of motor transport in support of forces in a theater of operations are normally of the following types:

- (1) Port and beach clearance.
- (2) Interdepot or interterminal connecting operations.
- (3) Line-haul services.
- (4) Intradepot or intrainstallation administrative support.
- (5) Direct support of tactical forces.

b. In evaluating specific types of motor hauls, the following terms are used:

- (1) *Local haul*—characterized by low running time in relation to loading and unloading time. These hauls normally involve a number of trips per day and are evaluated on the basis of tons moved during the operational period.
- (2) *Line haul*—characterized by high running time in relation to loading and unloading time. These hauls normally involve one trip or a portion of a trip per day and are evaluated on the basis of ton-miles.
- (3) *Shuttle*—repeated trips made by the same vehicles between two specified points.
- (4) *Relay*—the moving of supplies or troops in a continuous forward movement without transfer of load. It is accomplished by change of truck-tractors and/or drivers.
- (5) *Highway movement*—a movement

over a roadway. Higher than rated vehicle capacity loads are usually allowed on improved roadways.

- (6) *Off-road movement*—a movement off hard-surface roadways, over open country or wooded trails within the capabilities of the vehicles used.

7.11. Planning Factors

a. Because of the varied services performed, the different loads carried, and different terrain over which motor transport operations are conducted, planning factors should be used with caution and applied only in the absence of specific data on the local situation. (For classified motor transport planning factors, see FM 101-10, part III, ch. 5, sec. V.)

b. The following factors are used in highway transport planning for computing truck and truck company requirements in the absence of specific data:

- (1) *Vehicle availability*—the average number of task vehicles not in maintenance and therefore available for daily operations out of the total task vehicles assigned to a truck unit.
 - (a) Operational short range—83 percent.
 - (b) Long-range planning—75 percent.
- (2) *Vehicle payload*—the anticipated payload per vehicle (see table A, below). Following are rules of thumb only:
 - (a) Off-road—rated capacity of vehicle.
 - (b) Highway—rated capacity plus 50

percent for trailers or semitrailers and 100 percent for tactical wheeled vehicles.

- (3) *Trips per day*—the daily round trips which a vehicle will average. These will vary with running time and loading and unloading time. Following are general averages only:

- (a) Line haul—one per day.
(b) Local hauls—four per day.

- (4) *Length of haul*—the one-way distance cargo is to be hauled, from which round-trip mileage may be computed. Following are rules of thumb only:

- (a) Line haul—100 miles one way.
(b) Local haul—15 miles one way.

- (5) *Rate of movement*—the average number of miles covered in an hour, including halts during the period of movement. For long-range planning, the following estimates may be used:

- (a) Poor roads—10 miles in the hour.
(b) Good roads—15 miles in the hour.

- (6) *Operating turnaround*—the time, within total turnaround, consumed in loading, unloading, and movement. (See formula in par. 7.12.)

- (7) *Loading and unloading time*—time

consumed per turnaround in loading and unloading areas, including time waiting, spotting, documenting, and handling of cargo on and off vehicles.

- (a) *Straight trucks*—2.5 hours per round trip.

- (b) Semitrailers in relay operation—1 hour per relay; 4 hours loading and unloading time per round trip.

- (c) Truck-tractors in relay operations—1 hour per relay.

- (8) *Operational day*—the number of hours per day in which vehicles with drivers are normally employed.

- (a) One shift (peacetime)—10 hours.

- (b) Round-the-clock (war time)—20 hours.

- (9) *Unit lift and daily lift*—unit lift is the amount of cargo a truck unit is expected to move at one time; daily lift is that which it can move in a day with a number of trips. (See table B, part I, below.)

- (10) *Ton-miles and passenger-miles*—the product of the number of tons or passengers and the actual mileage they were moved. (See table B, part II, below.)

Table A. Vehicle Payload Capacities for General Planning

	1	2	3	4	5	6	7	8
1	Nomenclature	Off-road (tons)	Highway average (tons)	Highway maximum (tons)	Towing capacity (tons)		Passen- gers ¹	Cargo space
					Highway	Cross country		
2	Automobile, sedan, lt.....						24	
3	Bus, convertible, 37-passenger.....						37	or 18 liters.
4	Carrier, lt wpn, inf, ½-ton, 4x4.....	½		½				25 sq ft.
5	Carrier, pers, full-tracked, armd, M59.....	1½	1½	1½			10	
6	Carrier, pers, full-tracked, armd, M113E2.....						11	
7	Stlr, ego van, 6-ton, 2-wheel, M119.....	6	9	9			³ 24	1,020 cu ft.
8	Stlr, shop van, 6-ton, 2-wheel, M146.....	6	8	8				1,675 cu ft.
9	Stlr, stake, 6-ton, 2-wheel, M118.....	6	9	9			³ 24	1,130 cu ft.
10	Stlr, rcfrg, 7½-ton, 2-wheel.....	6	6	7½				790 cu ft.
11	Stlr, stake, 10-ton, 2-wheel.....	10	12	12			³ 50	1,014 cu ft.

See footnotes at end of table.

Table A. Vehicle Payload Capacities for General Planning—Continued

	1	2	3	4	5	6	7	8
1	Nomenclature	Off-road (tons)	Highway average (tons)	Highway maximum (tons)	Towing capacity (tons)		Passen- gers ¹	Cargo space
					Highway	Cross country		
12	Stlr, van, 10-ton, 4-wheel.....		8	10			³ 50	1,355 cu ft.
13	Stlr, cgo, 12-ton, 4-wheel, M127A1.....	12	12	18			³ 50	384 sq ft.
14	Stlr, low-bed, 12-ton, 25-ft.....	12	16	18				200 sq ft.
15	Stlr, sup van, 12-ton, 4-wheel, M129.....	⁴ 12	18	18			³ 50	1,342 cu ft.
16	Stlr, low-bed, 15-ton, 4-wheel, M172.....	25	16	25				320 sq ft.
17	Stlr, stake, 20-ton, 34-ft.....	20	18	24			³ 65	1,400 cu ft.
18	Stlr, van, 20-ton, 34-ft.....	20	18	24			³ 65	1,349 cu ft.
19	Stlr, low-bed, 25-ton, 4-wheel.....	25	25	30				
20	Stlr, tk transporter, 50-ton, 8-wheel, M15A2.....	⁴ 50	40	50				
21	Stlr, low-bed, 60-ton, 8-wheel, M162.....	60	60	60				204 sq ft.
22	Stlr, tk, gas, 5,000-gal, 4-wheel, M131A2.....	⁴ 3,000 gal	5,000 gal	5,000 gal				
23	Tlr, amph, cgo, $\frac{1}{4}$ -ton, 2-wheel.....	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{3}{8}$				60 cu ft.
24	Tlr, cgo, $\frac{3}{4}$ -ton, 2-wheel.....	$\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{1}{8}$				175 cu ft.
25	Tlr, cgo, $1\frac{1}{2}$ -ton, 2-wheel.....	$1\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{4}$				283 cu ft.
26	Tlr, ammo, 2-ton, 2-wheel.....	2	2	3				
27	Trk, amb, frontline, $\frac{1}{4}$ -ton, 4x4, M170.....						²⁴ or 3 liters.	
28	Trk, util, $\frac{1}{4}$ -ton, 4x4.....	0.4	0.4	0.6	1	$\frac{3}{4}$	²	66 cu ft.
29	Trk, amb, $\frac{3}{4}$ -ton, 4x4, M43.....						²⁸ or 5 liters.	
30	Trk, cgo, $\frac{3}{4}$ -ton, 4x4.....	$\frac{3}{4}$	1	$1\frac{1}{2}$	2		8	160 cu ft.
31	Trk, amph, $2\frac{1}{2}$ -ton, 6x6 (DUKW).....	$2\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{2}$			³ 30	195 cu ft.
32	Trk, amph, $2\frac{1}{2}$ -ton, 6x6, M147E2.....	$2\frac{1}{2}$	4	4			³ 40	385 cu ft.
33	Trk, cgo, $2\frac{1}{2}$ -ton, 6x6.....	$2\frac{1}{2}$	4	5	5	3	20	408 cu ft.
34	Trk, dump, $2\frac{1}{2}$ -ton, 6x6.....	$2\frac{1}{2}$	4	5	5	3	20	67.5 sq ft.
35	Trk, shop van, $2\frac{1}{2}$ -ton, 6x6, M220.....	$2\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	4	3		
36	Trk, shop van, $2\frac{1}{2}$ -ton, 6x6, M292.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	4	3		
37	Trk, tk, gas, $2\frac{1}{2}$ -ton, 6x6, M217.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$				
38	Trk, tk, water, $2\frac{1}{2}$ -ton, 6x6, M222.....	$1\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$				
39	Trk, cgo, 5-ton, 6x6 (single tires).....	5	6	$7\frac{1}{2}$	15	$7\frac{1}{2}$	20	513 cu ft.
40	Trk, cgo, 5-ton, 6x6 (dual tires).....	5	6	10	15	$7\frac{1}{2}$	20	513 cu ft.
41	Trk, dump, 5-ton, 6x6.....	5	$7\frac{1}{2}$	$7\frac{1}{2}$	15	$7\frac{1}{2}$	³ 15	135 cu ft.
42	Trk, cgo-prime mover, 10-ton, 6x6, M125.....	10	10	15	25	15		496 cu ft.

¹ Based on 18 inches per man. Does not include driver or assistant.

² Less individual field equipment.

³ Recommended for emergency use only. No troop seats provided.

⁴ Not generally used for this type of operation.

Table B. Truck Unit Capability Estimates for Long-Range Planning

I. Local haul—short tons per day (highway).

(Vehicle availability $\times$ average tons per vehicle $\times$ trips per day.)

Light truck company (2½-ton trucks)	45 $\times$ 4 $\times$ 4 =	720 STON/day
Light truck company (5-ton trucks)	45 $\times$ 6 $\times$ 4 =	1,080 STON/day
Medium truck company (semitrailer)	45 $\times$ 12 $\times$ 4 =	2,160 STON/day
Medium truck company (POL)	45 $\times$ 15 $\times$ 4 =	2,700 STON/day
Medium truck company (refrg 7½-ton)	45 $\times$ 6 $\times$ 4 =	1,080 STON/day
Heavy truck company (50-ton semitrailers)	18 $\times$ 40 $\times$ 4 =	2,880 STON/day

II. Line haul—forward ton-miles per day (highway).

(Vehicle availability $\times$ tons per vehicle $\times$ miles forward.)

Light truck company (2½-ton trucks)	45 $\times$ 4 $\times$ 100 =	18,000 ton-mi/day
Light truck company (5-ton trucks)	45 $\times$ 6 $\times$ 100 =	27,000 ton-mi/day
Medium truck company (semitrailer)	45 $\times$ 12 $\times$ 100 =	54,000 ton-mi/day
Medium truck company (POL)	45 $\times$ 15 $\times$ 100 =	67,500 ton-mi/day
Medium truck company (refrg 7½-ton)	45 $\times$ 6 $\times$ 100 =	27,000 ton-mi/day
Heavy truck company (50-ton semitrailers)	18 $\times$ 40 $\times$ 100 =	72,000 ton-mi/day

7.12. Computing Truck Unit Requirements

a. The following formulas may be used for highway transport planning:

- (1) *One-lift hauls.* To determine the number of truck companies required to move a given number of tons in one lift, use the following formula:

$$\frac{\text{Tons to be lifted}}{\text{Tons per vehicle} \times \text{vehicle availability per company}} = \text{Truck companies required.}$$

Example: To determine the number of transportation light truck companies required to move 2,700 short tons in one lift:

When: 2,700 = tons to be lifted.
4 = tons per truck, 2½-ton,
6 $\times$ 6.
45 = vehicles available per company.

$$\frac{2,700}{4 \times 45} = 15 \text{ transportation light truck companies required.}$$

Note. If the number of vehicles required is desired rather than the number of truck companies, omit the vehicle availability factor in the formula.

- (2) *Sustained haul in one continuous operation.* In most operations, there is a continuous flow of supplies forward from dumps, depots, beaches, or ter-

minals. In such cases, tonnages move forward only, and trucks return for another load. The average turnaround time required by the truck units to complete the round trip must be considered. Hence, the formula applicable is—

$$\frac{\text{Daily forward tonnage} \times \text{turnaround time}}{\text{Tons per vehicle} \times \text{vehicles available per company} \times \text{operating time/day}} = \text{Truck companies required.}$$

Example: To determine the number of transportation medium truck companies equipped with semitrailers, 12-ton, cargo, required to haul 5,000 short tons per day 180 miles forward from A to B, using the semitrailer relay method of operation.

When: 50 = tractor availability per company.
12 = tons per semitrailer, and at least two semitrailers per tractor are available.
20 = hours operating time daily.
1 = hours per relay in tractor operations.
15 = miles in the hour.

$$\frac{5,000 \times \left(\frac{180 \times 2}{15} + 16 \right)}{12 \times 50 \times 20} = 12.5 \text{ or } 13 \text{ medium truck companies.}$$

¹ Relay time obtained as follows: There is one relay at each end of each segment of a relay movement.

- a. The number of segments will depend on the method of operation. If it is desired to have drivers complete a round trip over a single segment in one shift, the following method of determining the length of the segment may be used:

10 hours = normal shift.

2 hours = relay time per segment.

8 hours = running time.

$\frac{8 \text{ hours}}{2} = 4 \text{ hours forward running time.}$

$4 \times 15 \text{ (MPH)} = 60 \text{ miles forward.}$

$\frac{180}{60} = 3 \text{ segments required.}$

$3 \times 2 \text{ (hours relay time per segment)} = 6 \text{ hours.}$

- b. As an alternate method in this situation, 1 relay point could be established at the end of 1 full shift of forward operation, giving 1 segment of 120 miles. The second shift would then accomplish the return movement over this segment. The segment of 60 miles could then be operated on a round trip per shift basis as outlined in a above. Any efficient combination of these methods may be used.

b. Similar formulas to those in a above can be used to compute requirements for troop movements or for hauling bulk liquid by using the number of persons or gallons, respectively, rather than short tons.

c. Through study and analysis of intelligence reports or the actual survey of road conditions in an area of operations, the highway planner may develop good reason for assuming that the planning factors as shown may be changed. He should, therefore, be in a position to alter his assumptions, computations, and the resulting requirements.

7.13. Truck Company Requirements

a. Having determined or assumed values for the factors in paragraph 7.12, the truck company requirements for any type of sustained operation may be estimated by use of the following formula:

$$\frac{\text{Daily tonnage} \times \text{operating turnaround}}{\text{Payload} \times \text{availability} \times \text{operating day}} = \text{Companies required.}$$

In this formula, "operating turnaround" is computed as follows:

$$\frac{\text{Round-trip mileage}}{\text{Rate of march}}$$

+ loading and unloading time
= Operating turnaround.

(If the number of trucks is desired rather than the number of truck companies, omit the "availability" factor in the basic formula.)

b. If it is desired to determine the number of truck companies required to move a given tonnage of cargo in one lift, the method of computation is—

$$\frac{\text{Total tonnage}}{\text{Payload} \times \text{availability}} = \text{Companies required.}$$

(Again, if the number of trucks is desired rather than truck companies, omit the "availability" factor from the formula.)

c. Examples (using planning factors given in par. 7.11, including table A).

- (1) Estimate the number of truck companies required for a 16-mile haul of 5,000 short tons of dry cargo daily, using 2½-ton, 6 x 6 trucks.

$$\text{Operating turnaround: } \frac{32}{10} + 2.5 = 5.7 \text{ hours}$$

$$\text{Requirements: } \frac{5,000 \times 5.7}{4 \times 45 \times 20} = 8 \text{ companies.}$$

- (2) Estimate the number of truck companies required to haul 3,000 short tons per day of dry cargo 180 miles, using 5-ton, 6 x 6 trucks, with 100 percent overload.

$$\text{Operating turnaround: } \frac{360}{10} + 2.5 = 38.5 \text{ hours.}$$

$$\text{Requirements: } \frac{3,000 \times 38.5}{10 \times 45 \times 20} = 13 \text{ companies.}$$

- (3) Estimate the number of 2½-ton, 6 x 6 trucks required to haul 700 tons in 1 lift:

$$\text{Requirements: } \frac{700}{4} = 175 \text{ trucks.}$$

(The above formulas may be used to compute requirements for hauling bulk liquid by substituting daily gallons for daily tonnage and payload in gallons rather than short tons.)

7.14. Highway Tonnage Capabilities

a. In selecting the routes over which cargo is to be hauled, consideration must be given to the capabilities of the roads and bridges to sustain the operation. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge, unless it is determined that such bridge(s) will be strengthened. It is difficult to determine the exact tonnage capabilities of highways for sustained operations because of the number of varying conditions which prevail. Also, the volume of tactical, administrative, and indigenous traffic to be accommodated on supply routes may exceed the number of cargo-hauling vehi-

cles, which further restricts the capabilities of highway transport.

b. The following table may be used as a guide in the absence of more accurate data for estimating the supply support tonnage capabilities of highways under varied conditions, assuming that operations are sustained, adequate road maintenance is provided, and each road bears two-way traffic. In using the table of reductions, when more than one limiting feature is involved, apply the narrow roadway factor first; then to the new capability, apply one of the next three on terrain; and finally, to the latter adjustment, apply the weather factor if the conditions are for a sustained period.

	1	2	3	4	5	6	7	8	9
	Highway type	Daily tonnage forward			Reductions applicable to various conditions ¹				
		Optimum dispatch route only (short tons)	Supply traffic communications zone (short tons)	Supply traffic combat zone (short tons)	Narrow roadway (percentage)	Rolling terrain (percentage)	Hilly with curves (percentage)	Mountainous (percentage)	Seasonal bad weather (percentage)
2	Concrete.....	60,000	36,000	8,400	25	10	30	60	20
3	Bituminous.....	45,000	27,000	7,300	25	10	30	60	30
4	Bituminous treated.....	30,000	18,000	5,800	25	20	40	65	40
5	Gravel.....	10,150	6,090	3,400	25	20	50	70	60
6	Earth.....	4,900	2,940	1,600	25	25	60	80	90

¹ Reduction factors are maximum under extreme conditions.

c. Planned tonnage movement should not exceed the capability of any portion of the road net to be used, unless reconstruction or heavy maintenance is provided to increase the capability of the section of highway or bridge to meet the demands. Otherwise, alternate routes must be selected to distribute the load. If no

alternate route is available and the indicated tonnage is not reduced, the highway or bridge can be expected to deteriorate rapidly and disrupt any sustained operation. (It should be kept in mind that maintenance vehicles and personnel on a road may also interfere with the flow of traffic and thereby limit capability.)

Section IV. PIPELINES

7.15. Capacity

The capacities of pipeline systems vary, depending on the size of pipe, gradient, location and size of pumps, and type of construction. Pipelines are capable of multiproduct opera-

tion. Welded commercial-type pipelines can be operated at much greater pressures than standard military victaulic-coupled lines. For planning purposes, the following capacities may be used:

Capacity of Standard Military Lightweight Steel Tubing

	1	2	3	4	5	6	7
1	Inside diameter of line (in)	Normal design capacity (bbl per hr)	Emergency capacity (bbl per hr)	Safe working pressure (psi)	Maximum working pressure (psi)	Gallons per day ¹	Net short tons per day
2	4-inch-----	355	393	600	750	298,000	910
3	6-inch-----	785	1,000	600	750	660,000	2,000
4	8-inch-----	1,355	1,730	450	600	1,140,000	3,480
5	12-inch-----	7,150	11,400	300	530	6,000,000	18,300

¹ Computed at normal design capacity, using an average operating day of 20 hours (average, all products).

7.16. Capability

Generally two 8-inch and one 6-inch pipelines or one 8-inch and three 6-inch pipelines are required (depending on the width of front) to maintain a 12-division slice plus air support.

For rapid planning of POL requirements, the average daily consumption of 1 division plus 1½ air wings equals 760 short tons (6,025 barrels) per day. This requirement is divided approximately 55 percent Air Force and 45 percent Army.

Section V. RAILWAYS

7.17. General

a. Railway construction data are contained in chapter 8.

b. Estimates of railway capacity, operating personnel, equipment, and supply requirements for a specific railway line should take into consideration the basic characteristics of the line, the nature of the country in which the operation is planned, and the purpose for which the planning is being done. The following items are considered essential to intelligent appraisal. If these are not available, their effects upon the operation must be assumed, based on overall information of railroad operations within the country involved.

- (1) Length of line.
- (2) Condition of roadbed and track.
- (3) Gage of track.¹
- (4) Single, double, or multiple track.
- (5) Weight and cross section of rail.
(Where mixed rail occurs, a complete

¹ Track gages vary widely, starting at 1 foot 11½ inches and going to 5 feet 6 inches. The most widely used gages are—

Broad	Standard	Narrow
5 ft 6 in.-----		3 ft 6 in.
5 ft 8 in.-----	4 ft 8½ in.-----	3 ft 3¾ in.
5 ft 0 in.-----		3 ft 0 in.

inventory of rail and compromise rail joints is desirable.)

- (6) Type of ballast and depth.
- (7) Type of ties (if wood, treated or untreated).
- (8) Tie spacing.
- (9) Axle load limitations (track and bridge).
- (10) Profile of line showing location and length of ruling grade. (Any helper grade or any momentum grade which is not the ruling grade should show location and description.)
- (11) Alinement of line showing location, length of minimum radius curves, and superelevation.
- (12) Location and description of bridges and tunnels.
- (13) Location, length, and description of passing tracks.
- (14) Location, type, and quantity of fuel supply.
- (15) Location, quantity, and quality of water supply.
- (16) Location and capacity of yards.
- (17) Location and capacity of—

- (a) Car repair tracks and enginehouses.
- (b) Heavy repair shops.
- (18) Type and availability of motive power.
 - (a) Weight in working order.
 - (b) Expected working tractive effort.
 - (c) Age.
- (19) Type and availability of rolling stock.
 - (a) Capacity and dimension.
 - (b) Age.
- (20) Allowable drawbar pull.
- (21) Diagrams showing minimum structure, maximum unrestricted loading, and equipment gages.
- (22) Signal system.
- (23) Dispatching facilities.
- (24) Route junctions.
- (25) Availability of new equipment and repair parts.
- (26) Indigenous labor resources.

c. A military railway operating division will vary from approximately 90 to 150 miles, depending on existing conditions. For general planning purposes, however, an average of 100 miles per railway division may be assumed.

7.18. Evaluation and Planning

Paragraphs 7.19 through 7.27 are designed primarily for wartime estimates of railway operations in a theater of operations. Analytical refinements and elaborate train density studies are difficult to justify and have been avoided because of the lack of basic information and the relative uncertainty inherent in military operations. The planner should also bear in mind that in the early stages of a war, indigenous equipment and labor may be utilized to a large extent, which again may vary the expected tonnage capacity. A more detailed estimate may be made using those methods and factors contained in FM 55-21.

7.19. Train Density

Train density is the number of trains per day which can be operated in each direction over a railway line. Work trains are not included in train density. Train densities will vary, depending on the condition of track; location, length, and type of passing siding; adequacy of terminal facilities; and availability of motive power

and rolling stock. Densities recommended below are averages based on experience under theater of operations conditions. After air superiority has been attained, the intensity of combat has been reduced, and, depending on judgment of operating conditions, densities achieved may be expected to exceed by 20 percent those presented below. (For planning capacities, see par. 7.4.)

Single track lines'-----10 trains per day in each direction.

Double track lines-----30 trains per day in each direction.

Multiple track lines-----The extra tracks will be used to rehabilitate and maintain two tracks in operation under most theater of operations conditions.

¹ Passing track intervals of 6 to 8 miles.

7.20. Net Trainload

The net trainload, or payload, carried by trains on different divisions of the same line may vary greatly, depending on the conditions of operation. Experience indicates that, under normal theater of operations conditions over standard gage railways, a net trainload of 400 short tons may be used as an *average* for general planning purposes. On narrow gage railways, a net trainload of 300 short tons may be used.

7.21. Net Division Tonnage

a. Net division tonnage is the net tonnage (short tons) or payload which can be moved over a railway division each day.

Formula:

Train density × average net trainload =
Net division tonnage.

b. Troop, hospital, or other special trains will replace an equal number of tonnage trains and, when operation of such trains is anticipated, the factor for train density must be so adjusted with the resulting decrease in net division tonnage.

7.22. Equipment Estimation

Planning data included herein are based on use of standard U.S. Transportation Corps equipment. Allowances for use of indigenous

or captured equipment should be based on judgment after evaluation of the many factors involved, such as availability of equipment, extent of expected destruction, condition of equipment, types and local availability of fuel, availability of repair parts, types of coupling devices, etc. Data are available in logistical surveys, special transportation studies based on intelligence reports, reports of governments or railroads in peacetime, and from articles appearing in such publications as *Railway Gazette* (British) and *Railway Age* (United States).

a. *Road Engines*. The following data are recommended for general planning purposes. Computation of requirements should be made for each division separately.

- (1) Average rate of travel from division terminal to division terminal—8 miles per hour.
- (2) Time in each division terminal for steam locomotives—8 hours.¹
- (3) Time in each division terminal for diesel-electric locomotives—3 hours.¹
- (4) Reserve engines, to allow for unforeseen circumstances such as operational peaks, heavy repairs, or destruction—20 percent.

Formula:

$$TD \times \frac{RT + TT}{24} \times 2 \times RF = \text{Number required for division, when}$$

TD = train density, one way.
 RT = average running time in hours.
 TT = terminal time at one end of the division.
 24 = number of hours in a day.
 RF = operational reserve factor = 1.2

b. *Switch Engines*.

- (1) Switch-engine requirements at water and inland terminals and division terminals are dependent on the physical track layout and the number of cars required to be handled at such points. The following may be used as a general guide only:

	1	2
1	Location	Requirements
2	Water and inland terminals.	1 per 67 cars dispatched or received per day.
3	Division terminals.	1 per 100 cars passing per day.

- (2) Requirements as computed above should be increased by 20 percent to allow for unforeseen circumstances, repairs, etc.

c. *Rolling Stock*.

(1) *Freight*.

- (a) Requirements are computed separately for operations between major supply installations or areas on each line of communications as follows:

$$\frac{\text{Daily tonnage}}{\text{Average tons per car}} \times \text{turnaround time} = \text{Number of cars.}$$

Turnaround time is the total estimated number of days required for a car from the time it is placed for loading at its point of origin, moved to its destination, unloaded, and returned to its point of origin. Such time may be computed as follows: allow 2 days at origin, 1 day at destination, and 2 days transit time for each division (or major portion thereof) which the cars must traverse. This method, rather than an actual hour basis, is used to incorporate delays due to terminal and way-station switching as well as in-transit rehandling of trains.

- (b) Computations should be increased by 10 percent to meet operational peaks, commitments for certain classes of cars, and bad order cars.
- (c) An average planning factor for net load per car may be assumed as follows:

<i>Standard gage to broad gage</i>	
U. S. equipment	20 tons
Foreign equipment	10 tons
<i>Narrow gage</i>	
U. S. equipment	15 tons
Foreign equipment	7½ tons

¹ Allows time for locomotive servicing, running repairs, and time lost between enginehouse and yards.

(d) Tank car requirements are computed separately, based on the bulk POL requirement and the computed turnaround time.

(2) *Passenger.*

(a) Passenger car requirements will vary, depending on troop movement

policies, evacuation policies, and rest and recuperation policies.

(b) Theater passenger car requirements are normally fulfilled by acquisition of local equipment, with the exception of hospital cars or trains.

7.23. Characteristics of U.S. Rolling Stock

	1	2	3	4	5	6	7	8
1	Type of car	Gage	Capacity		Tare weight (empty tons)	Inside dimensions		
			Cargo space	Tons		Length	Width	Height
	I. Foreign service							
2	Box (30-ton).....	Narrow	1,588 cu ft	30	13.6	34' 5½"	7' ¾"	6' 4"
3	Box (40-ton).....	Std to broad	2,520 cu ft	40	18.5	40' 6"	8' 6"	6' 5½"
4	Flat (30-ton).....	Narrow	247 sq ft	30	10.9	34' 5⅞"	7' 2"	-----
5	Flat (40-ton).....	Std to broad	351 sq ft	40	14.5	40' 9"	8' 7¼"	-----
6	Flat (80-ton).....	Std to broad	447 sq ft	80	33.3	46' 4"	9' 8"	-----
7	Flat, depressed center (70-ton)...	Std to broad	193 sq ft	70	41.5	50' 7"	9' 8"	-----
8	Gondola, high-side (30-ton)...	Narrow	946 cu ft	30	13.0	34' 5"	6' 10½"	4' 0"
9	Gondola, high-side (40-ton)...	Std to broad	1,680 cu ft	40	18.0	40' 0"	8' 3¾"	4' 0"
10	Gondola, low-side (30-ton)...	Narrow	356 cu ft	30	12.1	34' 6"	6' 10½"	1' 6"
11	Gondola, low-side (40-ton)...	Std to broad	500 cu ft	40	16.0	40' 4½"	8' 3¼"	1' 6"
12	Tank, POL (6,000-gal).....	Narrow	6,000 gal	20	16.0	-----	-----	-----
13	Tank, POL (10,000-gal).....	Std to broad	10,000 gal	35	19.0	-----	-----	-----
	II. Domestic service							
14	Box (50-ton).....	Std	3,975 cu ft	50	23.0	40' 6"	9' 2"	11' 0"
15	Flat (50-ton).....	Std	454 sq ft	50	25.5	43' 3"	10' 6"	-----
16	Flat (70-ton).....	Std	513 sq ft	70	27.0	49' 11"	10' 3"	-----
17	Flat (100-ton).....	Std	562 sq ft	100	35.0	54' 0"	10' 6¼"	-----
18	Gondola, high-side (50-ton)...	Std	1,770 cu ft	50	25.0	41' 6"	9' 6"	4' 6"
19	Gondola, low-side (50-ton)...	Std	1,184 cu ft	50	23.0	41' 6"	9' 6"	3' 0"
20	Tank, POL (10,000-gal).....	Std	10,000 gal	35	23.0	-----	-----	-----

Note. Average payload for each type of car, except tank cars, is 50 percent.

7.24. Outsize Equipment

Outsize equipment is that equipment which, because of extreme dimensions (height, width, length) or extreme weight, or combinations of the foregoing, will require special handling under restricted speeds and/or on special cars. The planner should recognize the fact that more and more of this type of equipment is being designed and should attempt to build a train of these outsize loads for a single movement rather than assume a few in each train moving on the line of communications. Such movements require special meeting points on adjacent lines of a double track line of communications and

will retard traffic returning to its point of origin as well as following trains in the same direction.

7.25. Personnel Requirements

The basic unit of railway organization in a theater of operations is the transportation railway operating battalion. This battalion operates and maintains a division of railway which is similar to US commercial railroad organization. Military organizations of administrative and operating personnel are designed to fulfill the operating personnel needs of the basic units (railway divisions) and the administrative personnel needs of the several divisions comprising

a system of railways. Personnel requirements are therefore estimated by division.

7.26. Supervisory, Operating, and Maintenance Organizations

a. *Supervisory.* The following organizations are supervisory:

- (1) *General headquarters, transportation railway service* (TOE 55-201). Normal requirement: One per two or more transportation railway commands.
- (2) *Headquarters and headquarters company transportation railway command* (TOE 55-302). Normal requirement: One per two or more transportation railway groups.
- (3) *Headquarters and headquarters company, transportation railway group* (TOE 55-202). Normal requirement: One per two to six transportation railway operating battalions and one or two transportation railway shop battalions.

b. *Operating.* Transportation railway operating battalion (TOE 55-225).

- (1) Requirements are estimated on the basis of the number of traincrews required. The 50 traincrews provided in company C of the battalion are the controlling factor. When augmentation is necessary, additional crews are provided by TOE 55-500, transportation service organization. This augmentation does not upset the equilibrium of the battalion for carrying out its assigned function, providing the normal length of line to be operated is not exceeded or motive power added exceeding the capabilities of company B for equipment maintenance. Normally, one transportation railway operating battalion is assigned to a railway division (usually 90-150 miles of main track).

(2) In estimating traincrew requirements, the following basis may be used:

- (a) *For road operations.* One crew per train per day (moving in either direction) per division.
- (b) *For switching.* Two crews per switch engine in operation. (For general planning purposes, reserve switch engines are not considered.)
- (c) *For road operations and switching.* Assume 80 percent availability of assigned crews to allow for sickness and other absences.

c. *Maintenance.*

- (1) *Transportation railway shop battalion* (TOE 55-235). Under normal requirements, one shop battalion may be expected to support 100 steam locomotives, 200 diesel-electric locomotives, and 2,500 cars; or perform depot maintenance monthly for 10 steam locomotives, 25 diesel-electric locomotives, and 600 cars. Exact requirements should be tempered by judgment and the overall railway plan for the theater.
- (2) *Railway workshop, mobile* (TOE 55-500). The railway workshop, mobile, may be required to provide back shop support in the initial phase of rail operations before the arrival of the shop battalion, or to perform repairs in forward areas to restore war-damaged equipment or to augment a railway shop battalion in lieu of an additional shop battalion.

7.27. Supply

a. *Fuel and Lubricants.* (See pars. 5.13-5.24.)

b. *Repair Parts.* Estimated repair parts requirements for motive power and rolling stock: 1.5 short tons per month for each train per day (moving in either direction) over each division.

Section VI. MOVEMENT OF TROOP UNITS BY RAIL

7.28. Space Requirements for Troop Loading on U.S. Equipment

For planning purposes and staff training, the following assumptions may be used:

a. Sleeping Cars, Average. Twenty-six troops in U.S. equipment (standard pullman) and 30 in tourist sleepers.

- (1) Normally, all personnel will be moved in standard pullmans, two per section.
- (2) In an emergency or during periods when there is a shortage of pullman equipment, it may be necessary to move personnel three per section. In this case, plans should be based on an average of 39 per standard pullman.

b. Coaches, Average. Fifty-five troops with individual equipment.

c. Passenger Trains (typical for long-distance moves). Thirteen sleeping cars, 2 kitchen cars, and 1 or 2 baggage cars—average 350 troops per train.

d. Freight Trains. For troop unit moves, including heavy equipment such as tanks, artillery, and engineer equipment, trains seldom exceed—

Infantry division—65 cars or 650 tons.

Armored divisions—55 cars or 1,200 tons.

e. Mixed Trains.

- (1) Mixed trains which carry all the personnel with their vehicles, artillery, and equipment are desirable from a tactical and organizational standpoint. Such moves are not economical when passenger equipment is in short supply, since mixed trains move at freight speed, and equipment is not fully utilized.
- (2) To maintain unit integrity (personnel and equipment), to include loading of all trailers with towing vehicles, will require 10 percent additional flatcars

over those required for separate loading.

7.29. Loading of Organizational Equipment

a. The amount of headquarters, kitchen, and maintenance equipment varies somewhat in all units. For planning purposes, allow 20 short tons per company or equivalent unit.

b. Organizational equipment moves under applicable freight classification rules and rates dependent on loading requirements. Checkable baggage up to 150 pounds on domestic moves and, normally, 350 pounds on moves to Army terminals will be carried free on the transportation tickets. When transportation groupings permit, checkable baggage for two companies or similar units may be loaded together.

c. For company or larger unit movements, CONEX containers should be utilized wherever practicable for consolidation and security of organizational equipment and baggage allowance less hand baggage.

7.30. Kitchen-Baggage and Flatcars

a. Kitchen-baggage and kitchen cars are furnished on the basis of one per 250 men or fraction thereof. Kitchen-baggage car requirements per train are dependent on transportation groupings. For tentative estimates, allow one per unit.

b. Compute flatcars (or drop-end gondolas) required on basis of maximum utilization of each car, regardless of length. Do not restrict computation to cars of all one length. Twelve inches at one end of each car must be left for brake-wheel clearance. For detailed approved methods of loading vehicles and equipment, see Association of American Railroads booklet, "Rules Governing the Loading of Mechanized and Motorized Army Equipment"; also, "Major Caliber Guns for the United States Army and Navy, on Open Top Equipment."

7.31. Recommended Loading of Typical Vehicles and Equipment

1	2	3
Nomenclature	Rail car	Unit per car
Carrier, pers, full-tracked, armd, M59.....	40' 0" flat	2
Gun, twin 40-mm, SP, full-tracked, M42.....	40' 0" flat	2
Howitzer, 105-mm.....	40' 0" flat	2
Howitzer, 155-mm.....	40' 0" flat	1
Howitzer, 155-mm, SP, full-tracked, M44 and M44A1.....	46' 0" flat	2
Semitrailer, cgo van, 6-ton, 2-wheel, M119.....	50' 6" flat	2
Semitrailer, tk transporter, 50-ton, 8-wheel, M15A2.....	40' 0" flat	1
Tank, cmbt, full-tracked, lt gun, M41A1.....	50' 6" flat	2
Tank, cmbt, full-tracked, med gun M48.....	40' 0" flat	1
Tank, cmbt, full-tracked, 120-mm gun, M103.....	40' 0" flat	1
Tank recovery vehicle, med, M74.....	50' 6" flat	2
Truck, util, ¼-ton, 4x4.....	50' 6" flat	8
Truck, cgo, ¾-ton, 4x4, WWN.....	50' 6" flat	3
Truck, cgo, 2½-ton, 6x6, WWN.....	50' 6" flat	2

1	2	3
Nomenclature	Rail car	Unit per car
Truck, dump, 2½-ton, 6x6, WWN.....	46' 0" flat	2
Truck, cgo, 5-ton, 6x6, WWN.....	56' 0" flat	2
Truck, med wkr, 5-ton, 6x6, WWN, M62.....	40' 0" flat	1
Truck, tractor, 5-ton, 6x6, M52.....	40' 0" flat	2
Truck, gun-lifting, hv, 4x4, front, M249.....	40' 0" flat	1

7.32 Infantry Division and Armored Division Rail Moves

The following tables show the amount of rail equipment needed to move infantry and armored divisions. The specific types of equipment to be used and the detailed makeup of each train must be worked out between the unit transportation officer and the installation transportation officer (CONUS movements) or the transportation officer of the area in which the movement originates (theater of operations movements).

a. Infantry Division, TOE 7D (strength 13,748).

1	2	3	4	5	6	7	8
TOE	Unit	Separate loading			Mixed trains		
		Sleepers ¹	Bag ²	Flat	Sleepers ³	Box ⁴	Flat
2	7-2D HQ & HQ co, inf div.....	11	0.5	13	8	0.5	15
3	7-11D Inf BG (5).....	(55)275	(3)15.0	(68)340	(37)185	(3)15.0	(62)310
4	6-100D Div arty.....	68	1.5	251	45	1.5	222
5	1-7D Avn co.....	9	0.5	51	53	0.5	20
6	55-79D Trans acft maint det.....	3	0.5	9	2	0.5	10
7	17-65D Armor bn, 90-mm.....	29	3.0	154	20	3.0	169
8	17-85D Cav sq.....	26	2.0	74	17	2.0	82
9	5-15D Engr bn.....	30	3.0	127	20	3.0	140
10	11-5D Sig bn.....	20	1.5	90	14	1.5	78
11	7-62D HQ & HQ det and band, inf div tn.....	3	0.5	8	2	0.5	6
12	10-17D QM co.....	8	0.5	36	5	0.5	40
13	8-15D Med bn.....	12	1.5	22	8	1.5	23
14	9-25D Ord bn.....	13	1.0	62	8	1.0	68
15	12-7D Admin co.....	6	0.5	10	4	0.5	7
16	55-75D Trans bn.....	21	2.0	135	14	2.0	155
17	Total.....	534	33.5	1,382	355	33.5	1,345

Separate loading (40 passenger trains—average 13 S, 1 or 2 K, 1 or 2 B) ¹
(20 freight trains—average 80 cars).

Mixed trains (Number of trains dependent on car groupings)

¹ 26 men per standard sleeper.

- ¹ One per two companies or similar units.
² 39 men per standard sleeper.
³ Boxcars substituted for baggage cars.
⁴ Allowance made for personnel who will travel with aircraft.
⁵ Does not include aircraft.
⁶ S—sleeper car.
B—baggage car.
K—kitchen car.

b. Armored Division, TOE 17D (strength 14,617).

	1	2	3	4	5	6	7	8
	TOE	Unit	Separate loading			Mixed trains		
			Sleepers ¹	Bag ²	Flat ³	Sleepers ⁴	Box ⁵	Flat ⁶
2	17-2D	HQ & HQ co, armd div.....	7	0.5	17	5	0.5	19
3	17-22D	HQ & HQ co, CC (3).....	(5) 15	(0.5) 1.5	(13) 39	(4) 12	(0.5) 1.5	(15) 45
4	6-300D	Div arty.....	98	10.5	240	65	10.5	325
5	1-17D	Avn co.....	11	0.5	65	65	0.5	741
6	55-79D	Trans acft maint det.....	3	0.5	6	2	0.5	11
7	19-29D	MP co.....	6	0.5	10	4	0.5	12
8	17-25D	Armor bn, 90-mm (4).....	(28) 112	(2.5) 10.0	(120) 480	(19) 76	(2.5) 10.0	(132) 528
9	17-45D	Car sq.....	32	2.5	77	21	2.5	91
10	7-25D	Inf bn (4).....	(40) 160	(2.5) 10.0	(73) 292	(27) 108	(2.5) 10.0	(81) 324
11	5-5D	Engr bn.....	40	3.0	172	27	3.0	209
12	11-55D	Sig bn.....	20	1.5	62	14	1.5	81
13	17-62D	HQ & HQ det and band, armd div tn.....	3	0.5	5	2	0.5	6
14	10-45D	QM bn.....	17	1.5	89	11	1.5	148
15	9-65D	Ord bn.....	24	2.0	93	16	2.0	142
16	8-75D	Med bn.....	14	1.5	36	9	1.5	53
17	12-27D	Admin co.....	7	0.5	6	5	0.5	7
18	-----	Total.....	569	47.0	1,689	382	47.0	2,042

Separate loading (44 passenger trains—average 13 S, 1 or 2 B, 1 or 2 K).⁸
(34 freight trains—average 50-55 cars).

Mixed trains (Number of trains dependent on car groupings).

¹ 26 men per standard sleeper.

² One per two companies or similar units.

³ Common-size flatcars used in the compilation of this table include—

46-foot, 50-ton capacity.

50-foot, 50-ton capacity.

53-foot 6-inch, 70-ton capacity.

⁴ 39 men per standard sleeper.

⁵ Boxcars substituted for baggage cars.

⁶ Allowance made for personnel who will travel with aircraft.

⁷ Does not include aircraft.

⁸ S—sleeper car.

B—baggage car.

K—kitchen car.

7.33. Weight of Tracked Vehicles

The tracked vehicles of the divisions, with their towed loads, make up approximately the following tonnages:

Infantry division11,000 tons
Armored division34,000 tons

(In theaters of operation and for mixed trains in the United States, the crews and other troops which normally travel in or on the

tracked vehicles usually will ride on the same train.)

7.34. Movement of Troop Units on Foreign Railways

a. The capacity of railroads and railway equipment fluctuates widely throughout the nations of the world. Experience in Europe during World War II indicates that under the pressure of all-out war, there are few, if any,

places in the world where complete troop units can be moved by rail at the same time that the rail net is supplying a major force. A compromise policy was developed in which tracked vehicles and foot troops were moved by rail whenever facilities were available and wheeled vehicles, with their normal towed loads, proceeded on highways.

b. Assumed Capacity of Foreign Rail Facilities:

(1) *Freight cars.*

War flats -----	50 tons
Medium flatcars ----	25 tons
Small flatcars -----	12 tons
Boxcars -----	10 tons or 25 troops

(2) *Passengers.*

Coaches ¹ -----	40 troops
Sleeping cars ¹ -----	32 troops

¹ In the forward areas, passenger equipment is seldom used for unit moves. The limited amount of available equipment may be used for movement of casualties, convalescents, redeployment groups, or leave trains.

(3) *Trains (foreign).*

Maximum length ---	40 cars
Maximum net load--	400 tons
Maximum troops ---	1,000 (using boxcars)

7.35. Troop Movement Planning

a. *Scales.* In training and preparation for movement, all units will become familiar with the use of railway car loading scales, or equivalent scales, tables, or templates (par. 7.36).

b. *Rail Movement Table.* Tables are to be maintained by all units for movement by *all means* of transportation.

c. *Types of Tables.* When the rail movement has been ordered and the approximate types of equipment requested, the following tables must be prepared by each unit:

Train consist table (par. 7.38).

Entraining table (par. 7.39).

Individual train-loading plan (par. 7.40).

d. *Alert Time*—(CONUS). An alert is not an order, and rail carriers do not move equipment into position for loading on an alert. It requires 48 hours after receipt of orders by the Chief of Transportation to start loading a division, assuming that no equipment is available at the installation.

e. *Loading Time*—(CONUS). Passenger trains require 1 hour for loading. Baggage cars for personal baggage and baggage cars for kitchen purposes will be spotted in advance. The time required to load troop units with all vehicles and equipment on freight trains varies with the training status of the unit and the conditions at the loading point. Use 6 hours of planning.

7.36. Railway Car Loading Templates

In preparing loading plans and determining flatcar requirements, car loading templates are helpful. The first step is to prepare templates to a suitable scale ($\frac{3}{8}$ " = 1 foot or $\frac{1}{2}$ " = 1 foot is recommended) for each item of equipment to be loaded. The transportation officer, or representative of the commercial carrier, can provide dimensions of the usable loading space of the various pieces of rolling stock which can be furnished. A diagram of the usable loading space is then drawn to the same scale as the equipment templates. By placing the templates over the usable loading space, the most economical car loading arrangements can be determined.

7.37. Rail Movement Table
(Sample)

Infantry Division TOE 7D1234																										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	TOE	Unit	Strength		Organizational equipment		Checkable baggage		Vehicles and equipment per unit								Railway car requirements per unit									
									Standard vehicles						Special equipment		Passenger		Freight							
									Trailers			Trucks					Coach	Pullman	Box		Flatcars					
			Off & WO	EM	Pieces	Weight	Pieces	Weight	Trailer, amphib. cargo, 1/4-ton 4' W 9' L	Etc.	Etc.	Truck, utility, 1/4-ton, 4 X 4 5' W 11.5' L	Etc.	Etc.	Items	Shipping length, feet	48 men	Std nr of sec (2 sec)	Tour nr of sec (3 sec)	Kitchen baggage	Organizational equipment	Checkable baggage	40'	42'	50'	
2	7-21D	HQ & HQ co, inf div																								
3	7-11D	Inf BG (5)																								
4	7-12D	HQ & HQ co																								
5	7-17D	Rifle co (5)																								
6	7-19D	Cmbt spt co																								
7	6-100D	Div arty																								
8	6-101D	HQ & HQ btry																								
9	6-115D	FA how bn, 105-mm and 155-mm, towed (3).																								
10	6-116D	HQ & HQ btry																								
11	6-117D	FA how btry, 105-mm, towed.																								
12	6-118D	FA how btry, 155-mm, towed.																								
13	6-125D	FA how bn, 105-mm and 155 mm SP (2),																								
14	6-126D	HQ & HQ btry																								
15	6-127D	FA how btry, 105-mm, SP																								
16	6-128D	FA how btry, 155-mm, SP																								
17	6-135D	FA bn, 762-mm rkt, SP, 8-in how, towed.																								
18	6-136D	HQ & HQ btry																								
19	6-137D	FA how btry, 8-in, towed																								
20	6-138D	FA msl btry, 762-mm rkt, SP.																								
21	17-65D	Armor bn, 90-mm																								
22	17-66D	HQ & HQ co																								
23	17-27D	Med tk co (5)																								
24	17-85D	Cav sq																								
25	17-86D	HQ & HQ trp																								
26	17-57D	Armd cav trp (3)																								
27	1-71D	Avn co																								
28	55-79D	Trans acft maint det																								
29	5-15D	Engr bn																								
30	5-16D	HQ & HQ co																								
31	5-17D	Engr co (5)																								
32	11-5D	Sig bn																								
33	11-6D	HQ & HQ co																								
34	11-7D	Comd op co																								
35	11-8D	Fwd comm co																								
36	7-62D	HQ & HQ det and band, inf div tn.																								
37	12-71D	Admin co																								
38	10-17D	QM co																								
39	9-25D	Ord bn																								
40	9-26D	HQ & main spt co																								
41	9-27D	Fwd spt co																								
42	8-15D	Med bn																								
43	8-16D	HQ & HQ det																								
44	8-17D	Amb co																								
45	8-18D	Clr co																								
46	55-75D	Trans bn																								
47	55-76D	HQ & HQ co																								
48	55-77D	Trk transport co																								
49	55-78D	Armd carr co (2)																								
50		Total inf div																								

¹Can be adapted to any type unit.
²This tentative table should be maintained currently by division transportation officers in compliance with paragraph 10, AR 220-10. Subordinate and separate units should maintain similar tables
³Upon receipt of movement order, the table will be revised to reflect actual strength and equipment on hand and to conform to provisions of the movement order
⁴Organizational equipment and checkable baggage must be listed separately.

7.38. Train Consist Table

Division

Train No.	Transportation groupings	Coach	Railway equipment						Train officers
			Pullman		Kitchen or kitchen-baggage	Box	Flat and gondola	Total	
			Standard	Tourist					
1									CO Mess off Surg CO Mess off Surg CO
2									
3									

Notes 1. Upon receipt of movement order, commanding general will designate the order in which units will be forwarded.

2. Train consist table is prepared by division transportation officer from data appearing on revised rail movement table.

3. Maximum and minimum length of trains (total number of freight and passenger cars) will be prescribed by the origin railroad.

4. Under "transportation groupings," show units which will comprise each individual train.

5. Under "train officers," show by name the officers assigned to each train.

7.39. Entraining Table

Division

[illegible]

Notes 1. Upon completion of train consist table and individual train loading plan, division transportation officer will prepare this entraining table.

2. "Train number" will be as shown on train consist table.

3. In CONUS, the "main number," which authorizes the movement of each train, will be issued by the Military Transportation Section, Association of American Railroads, through the Passenger Division Military Traffic Management Agency, Washington, D.C., to the local transportation officer, who will furnish main number to division transportation officer. In theaters of operation, the main number normally will be issued by the theater army logistical command transportation officer.

4. Entraining officers will be designated by name.

7.40. Individual Train-Loading Plan

Division

Train No. Main No.

Assignment of Personnel and Equipment to Individual Railway Cars

Front

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	Continue to last car				rear

Suggested Symbols for Equipment and Vehicles

Equipment	Symbol	Equipment	Symbol	Equipment	Symbol	Equipment	Symbol
Coach.....	CH	Box.....	BX	Howitzer, 105-mm...	HL		
Pullman, standard....	SP	Truck, ¼-ton.....	TJ	Howitzer, 155-mm...	HM		
Pullman, tourist.....	TP	Trailer, ¼-ton.....	TQ				
Troop sleeper.....	TS	Truck, 2½-ton.....	TC				
Kitchen car.....	K	Motorcycle.....	MC				
Kitchen-baggage.....	KB						

Assignment of Units to Cars (by Block Numbers Above)

Unit	Block No	Unit	Block No.	Unit	Block No

Notes 1. This plan is prepared by the division transportation officer. Copies should be furnished to—

- Troop commanders
- Entraining officers.
- Officer in charge of troops (train).
- Motor park dispatcher so that vehicles will arrive at entraining point in the order in which they will be loaded on railway cars.
- Local transportation officer.

2. In each block, indicate by symbol the specific personnel and equipment assigned to each car.

3. In each block, representing an open-top freight car (flatcar or gondola car), indicate by symbol the equipment specifically assigned to each car.

4. In the space provided at the bottom of the plan, all cars (freight and passenger) should be assigned by block numbers (not by railroad car initials and numbers) to the specific units which will occupy them.

Section VII. AIR TRANSPORTATION

7.41. General

a. The movement of troops by air transportation provided by the Air Force is normally ordered by the headquarters in command of both the transported and transporting units. These orders are issued simultaneously to the commander of the unit to be transported and to the commander of the transporting unit.

b. Troop movements by air are of two types: tactical and administrative. When the move is tactical, the loading plans will depend on the tactical mission to be accomplished at the end of the move. An administrative move is merely a ferrying operation from one base to another. It is not feasible to prescribe standard tactical loads for the air transport of personnel and equipment because of the variable conditions surrounding each operation. For example, the loading plans will vary depending on the mission, the aircraft available, the distance to be flown, the conditions of the flight, the security of the landing area, the time available for disassembly and assembly of equipment, the amount of supplies to be transported with the troops, the size of engineer tools needed in the terrain to be encountered, and other factors. For more technical data on the loading of transport aircraft, see TM 57-210.

c. The air movement of a large body of troops normally will involve concurrent departures from several airfields and, in the objective area, concurrent landings at several terminal landing strips. The availability of transport aircraft and base facilities, the urgency of the situation, and the likelihood of hostile interference will be major factors which determine the number of installations employed, as well as the number of sorties to be made by the transporting aircraft. For considerations governing the employment of air transportation, see FM 100-5. For staff procedures, air movement tables, and other forms relative to air movements, see FM 7-100, FM 57-100, and TM 57-210.

7.42. Air Movement of Supplies

a. *General.* Supplies may be air landed in powered aircraft, landed by parachute in stand-

ard containers or by heavy drop, or they may be delivered by the free-fall method.

b. *Air-Landed.*

- (1) The allowable cargo load for each type of aircraft determines the amount of bulk supplies that may be transported. TM 57-210 contains payload-distance graphs to assist the staff planner in determining allowable cargo loads for each type of aircraft for a given mission radius. In field operations, allowable cargo loads may have to be modified because of such variable conditions as temperature, altitude, and humidity. Therefore, the announced allowable cargo load for a given operational environment may differ from the planning factors shown.
- (2) To determine the aircraft requirements, the following formula may be used (airplanes—all types):

$$y = \frac{b}{x}, \text{ when}$$

y = number of aircraft required.

b = weight of supplies in pounds to be landed.

x = allowable cargo load of airplane in pounds for radius or range used.

Example. To determine C-119 aircraft requirements for air-landing of 600 tons of supplies to be moved 500 miles under radius conditions.

1. Allowable cargo load for 500 miles under radius conditions is determined to be 17,000 pounds.

2. Total weight of supplies $600 \times 2,000 = 1,200,000$ pounds.

$$3. y = \frac{1,200,000}{17,000} = 70.6 \text{ or } 71 \text{ C-119's.}$$

c. *Parachute.*

- (1) The amount of supplies to be delivered by parachute from the various types of aircraft is dependent on the number and types of containers that can be carried and the container ejection means that can be employed. See TM

57-210 for aerial delivery characteristics of the various aircraft.

- (2) To determine aircraft requirements for the delivery of parachute supplies, the same basic formula used for air-landed supplies may be used:

$$y = \frac{b}{x}$$

7.43. Army Aircraft

a. General. Army aircraft, both fixed-wing and rotary-wing, are employed to move cargo, personnel, and equipment within the combat zone. Performance standards are affected by many variables, such as load/fuel, altitude, temperature, humidity, existing weather, airfield characteristics, individual aircraft characteristics, and aviator proficiency. The weight-lifting capabilities of all aircraft are particularly dependent on air density or density altitude, which

is composed of the three variables: altitude, temperature, and humidity. As air density decreases, lift capability decreases. Wind can materially affect operations; and in operations requiring long ranges or maximum lift capabilities, wind may become a critical factor. Payloads may be increased or decreased because of variations in density, altitude, and wind velocity. The Army aviation staff officer should be consulted for accurate, detailed computations to meet specific requirements. The information in the table in *b* below was prepared to determine optimum data for planning by commanders and staff officers and to provide reliable data for practical use by Army aviators operating under normal conditions without undue sacrifice in loads required to accomplish the mission of Army aviation. Overloading of aircraft must be by decision of the aviation unit commander for specific conditions and loads.

b. Army Aircraft Characteristics.¹

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	1
1	Item	Unit	H-13G (Sioux)	H-13H (Sioux)	H-19D (Chickasaw)	H-21C (Shawnee)	H-23C (Raven)	H-23D (Raven)	H-34A (Choctaw)	H-37A (Mojave)	HU-1A (Iroquois)	HC-1B ² (Chinook)	L-19A (Bird Dog)	L-20A (Beaver)	L-23D (Seminole)	U-1A (Otter)	AO-1A ³ (Mohawk)	AC-1 ⁴ (Caribou)	
2	Nomenclature.....		Hel, obsn	Hel, obsn	Hel, util	Hel, lt transport	Hel, obsn	Hel, obsn	Hel, lit transport	Hel, med transport	Hel, util	Hel, transport	Airplane, util obsn	Airplane, util	Airplane, util transport	Airplane, transport	Airplane, cmbt/survl	Airplane, transport	2
3	Crew (recommended) (200 lb ea).....	ea	1	1	2	2	1	1	2	3	2	2	1	1	1	2	2	2	3
	Dimensions:																		
4	Length—fuselage.....		31' 5"	31' 5"	42' 2"	52' 7"	28' 2"	28' 6"	46' 9"	64' 11"	39' 6"	49' 10"	25' 10"	30' 5"	31' 6"	41' 10"	41' 0"	72' 7"	4
5	Length—blades unfolded.....		41' 5"	41' 5"	62' 3"	86' 4"	40' 6"	40' 8"	65' 10"	88' 0"	53' 0"	98' 2"	NA	NA	NA	NA	NA	NA	5
6	Length—blades folded.....		NA	NA	42' 2"	52' 7"	NA	NA	37' 0"	55' 8"	NA	49' 10"	NA	NA	NA	NA	NA	NA	6
7	Width—blades folded.....		NA	NA	11' 7"	14' 0"	NA	NA	13' 0"	27' 4"	NA	12' 1"	NA	NA	NA	NA	NA	NA	7
8	Width—tread.....		7' 6"	7' 6"	11' 0"	13' 4"	7' 6"	7' 9"	12' 0"	19' 9"	8' 4"	10' 4"	7' 7"	10' 2"	12' 9"	11' 2"	9' 2"	23' 1"	8
9	Height—extreme.....		8' 8"	9' 4"	15' 3"	15' 9"	9' 10"	10' 2"	15' 10"	22' 4"	11' 6"	18' 6"	7' 6"	9' 0"	11' 6"	12' 5"	12' 8"	31' 9"	9
10	Diameter—main rotor.....		35' 2"	35' 2"	53' 0"	44' 0"	35' 0"	35' 5"	56' 0"	72' 0"	44' 0"	59' 0"	NA	NA	NA	NA	NA	NA	10
11	Diameter—tail rotor.....		5' 8"	5' 8"	8' 9"	NA	5' 6"	5' 6"	NA	15' 0"	8' 6"	NA	NA	NA	NA	NA	NA	NA	11
12	Wing span.....		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36' 0"	48' 0"	45' 4"	58' 0"	42' 0"	96' 5"	12
	Cargo compartment:																		
13	Height of floor above ground.....	in.	NA	NA	30"	38"	NA	NA	34"	36"	26"	30"	22"	46"	NA	46"	NA	45"	13
14	Length (usable).....	in.	NA	NA	120"	240"	NA	NA	164"	364"	48"	360"	NA	76"	NA	152"	NA	5 28' 9"	14
																		6 32' 6"	
15	Width (floor).....	in.	NA	NA	60"	50"	NA	NA	59"	81"	80"	90"	NA	48"	NA	60"	NA	73"	15
16	Height (clear of obstructions).....	in.	NA	NA	72"	62"	NA	NA	70"	67"	48"	78"	NA	51"	NA	60"	NA	74"	16
17	Cargo space (optimum).....	cu ft	NA	NA	300	422	NA	NA	363	1,142	107	1,462	NA	125	NA	286	NA	1,090	17
18	Cargo door—width/height/location.....	in.	NA	NA	48" x 48" Right	Cargo: 45" x 59" Left Rescue: 37" x 59" Right	NA	NA	52" x 48" Right	87" x 67" Nose 72" x 48" Bottom 72" x 72" Right	48" x 48" Left and Right	90" x 78" Rear	45" x 33" Right	39" x 40" Left and Right	30" x 30" Right	46" x 45" Left 30" x 45" Right	NA	73" x 74" Rear	18
19	External cargo: Maximum recommended external load ⁷	lb	NA	NA	1,000	3,000	NA	NA	4,000	7,000	2,200	16,000	9 145 ea wing NA	500 ea wing NA	10 300	NA	1,950	NA	19
20	Rescue hoist capacity.....	lb	NA	NA	400	400	NA	NA	600	600	NA	600	NA	NA	NA	NA	NA	NA	20
	Passenger capacity:																		
21	Troop seats.....	ea	1	1	11 10	11 20	2	2	12 or 11 18	23 or 11 33	4	33	1	4	4	8	1	32	21
22	Litters.....	ea	12 2	12 2	6	12	12 2	12 2	8	24	2 plus 1 ambula- tory	24	NA 1 ambula- tory	2 plus 2 ambula- tory	NA	6 plus 3 ambula- tory	NA	14 plus 8 ambula- tory	22
	Operating characteristics:																		
23	Recommended gross weight.....	lb	2,350	13 2,350	7,300	13,500	2,500	2,700	13,300	31,000	6,400	14 33,000	15 2,400	5,100	7,000	7,600	12,600	28,500	23
24	Operating weight ¹⁶	lb	1,752	1,887	6,100	9,700	1,944	1,998	8,428	22,355	4,200	16,000	1,865	3,547	5,260	5,201	10,083	19,015	24
25	Payload and fuel ¹⁷	lb	598	463	1,200	3,800	556	702	4,872	8,645	2,180	17,000	535	1,553	1,740	2,399	2,517	9,485	25
26	Cruise speed with payload (true air speed).....	knots	60	70	65	70	60	60	75	80	80	130	87	105	160	100	200	156	26
27	Maximum speed with payload (true air speed).....	knots	78	80	80	85	73	80	90	80	90	150	96	110	170	105	275	180	27
28	Maximum range (ferry) ¹⁸	nautical mi	150	170	230	295	88	158	240	200	141	1,037	350	590	1,260	900	1,500	1,040	28
29	Maximum range with payload (full fuel) ¹⁸	nautical mi	145	170	185	255	77	135	195	180	126	200	350	575	980	720	400	850	29
30	Grade of fuel ¹⁹	octane	91/96	80/87	91/96	100/130	91/96	80/87	115/145	115/145	JP-4	JP-4	80/87	80/87	100/130	80/87	JP-4	100/130	30
31	Maximum fuel capacity (usable) ²⁰	lb	245	242	903	1,770	156	271	1,545	4,130	825	4,158	248	814	1,358	1,272	1,683	4,956	31
		gal	41.5	41	153	300	26.5	46	262	700	125	630	42	138	230	216	256	840	
32	Fuel consumption per hour—cruise speed ²¹	lb	84	84	270	515	92	100	22 450	22 1,190	377	1,600	48-60	132-144	192-216	198	750	690	
		gal	14	14	45	87	15	17	23 510	23 1,320	57	242	9	23	34	33	114	117	32
									22 76	22 210									
									23 86	23 224									

¹ Data are compiled from latest available technical manuals (1-series) and, where necessary, from experience factors.

² Characteristics in this column are compiled from preliminary design data and are subject to change.

³ Based on AC-1 production models.

⁴ Unit SOP may include crew chief in addition to crew shown.

⁵ To forward edge of loading ramp.

⁶ To aft edge of loading ramp.

⁷ Limited by payload.

⁸ Based on 1959 test data.

⁹ Maximum allowable overload is 250 lb each wing for very short-range mission. (See line 25)

¹⁰ Capacity of aft baggage compartment.

¹¹ Use of all seats requires command approval of overload.

¹² Cargo may be carried on litter racks in lieu of patients.

¹³ With fuel reduction, two passengers or two litters are acceptable overload.

¹⁴ Maximum gross weight mission at sea level on standard atmosphere day.

¹⁵ L-19 has maximum recommended gross weight of 2,400 lb on long runway and 2,165 lb for takeoff over barrier

¹⁶ Includes aircraft, oil, and crew (line 3). Does not include usable fuel.

¹⁷ May be internal, external, or combination. This line includes usable fuel and cargo or passengers.

Fuel required = $\frac{\text{Distance (nautical mi)}}{\text{Cruise speed (line 26)}} \times \text{Fuel consumed per hr (lb) (line 32)}$.

¹⁸ With 30-inch fuel reserve provided.

¹⁹ Military specifications for all grades of AVGAS is MIL-F-5572. See TB AVN 2 for alternate aircraft fuels.

²⁰ JP-4 fuel computed at 6.6 lb per US gal; all others computed at 5.9 lb per US gal.

²¹ Assuming 59° F., 29.92" Hg. and 2,000' alt. Add 5 percent for wnmup, climb, and other contingencies.

²² Without payload.

²³ With payload.

c. *Rotary-Wing Aircraft.*

(1) *General.* Army rotary-wing aircraft (helicopters) are limited in speed and range as compared with fixed-wing aircraft. However, their ability to land and take off vertically permits the delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to fixed-wing aircraft. Likewise, their capability for flight at relatively slow speeds permits continued operations under weather conditions of low ceiling and restricted visibility.

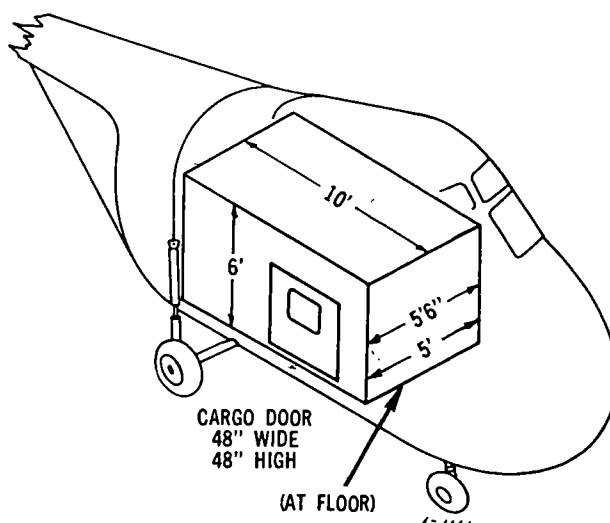
(2) *Planning factors (rotary-wing).* (See also FM 101-10, part III, ch. 5, sec. V.)

(a) *Availability.* The number of helicopters available for a mission at any one time will depend on the status of maintenance and inspections on the helicopters in the unit. Experience indicates that about two-thirds (67%) of the helicopters assigned to a unit are available for flying during continuous operations. On a mission of short duration (less than 6 days), approximately 90 percent of assigned aircraft will be operational.

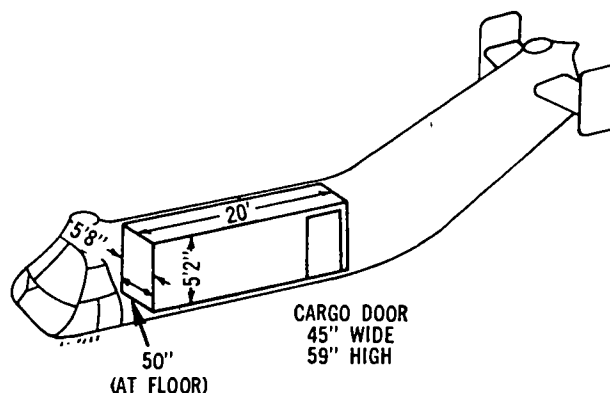
(b) *Cargo.* The dimensions of packages are restricted only by the size of the cargo compartment doors and/or the system used to carry the cargo externally—assuming, of course, that the weight of the package(s) does not exceed the weight limitations for the aircraft under prevailing conditions. Typical items of cargo for internal loading are boxes of rations, ammunition, signal equipment, vehicle and aircraft

parts, and supplies. Loads too large to fit into the cargo compartment but under the maximum weight permissible for external loads may be carried slung under the helicopter to expedite loading and unloading.

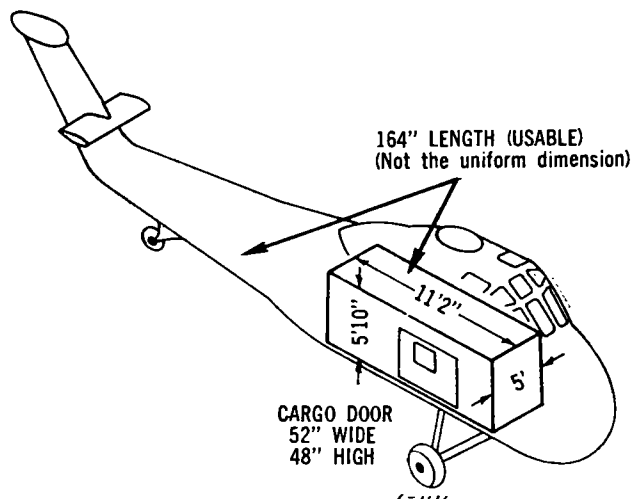
1. *H-19 (Chickasaw).*



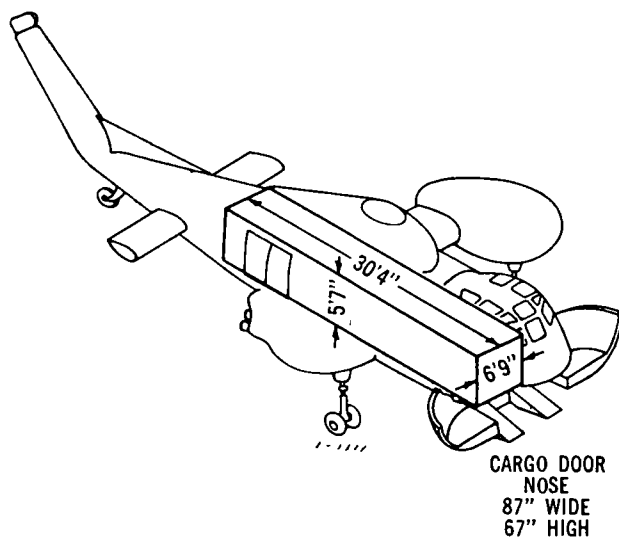
2. *H-21 (Shawnee).*



3. H-34 (Choctaw).



4. H-37 (Mojave).



(c) *Landing facilities.* Provision must be made for adequate landing sites when planning helicopter movements. The minimum requirements for landing sites are as follows. However, larger areas with cleared approaches are highly desirable to improve safety margins of operation.

H-13, H-23	---20 yards × 20 yards
H-19, HU-1A	---30 yards × 30 yards
H-21, H-34	---30 yards × 50 yards
H-37	-----50 yards × 70 yards

(d) *Maintenance.* Maintenance facilities should be provided at all base landing sites, the minimum requirement being a sheltered area which will provide adequate shelter for organizational maintenance on the helicopters. For planning purposes, 16 maintenance man-hours per flying hour may be considered average for the H-19, 17 hours for the H-21 and H-34, and 25 hours for the H-37.

(e) *Hours of operation.* The average number of hours of operation per day for continuous operations should not exceed 4 hours per helicopter.

(f) *Loading or unloading time.*

Personnel:

Troops	----- 3 minutes
Casualties	----- 10 minutes

Cargo:

Internal in fuselage	--- 5 minutes
Suspended beneath helicopter.	30 seconds

(g) *Payload guidance (assumed mission of 50-nautical mile radius).*

	1	2	3	4	5	6
1	Model	Per aircraft ¹				
		Aircraft per company	Fully equipped troops ²	Recommended payload (tons)	Litter patients	Average cruising speed (knots)
2	H-19D.....		3	0.33	3	65
3	HU-1A.....		4	0.76	2	80
4	H-21C.....	20	12	1.40	12	70
5	H-34A.....	20	12/18	2.00	8	75
6	H-37A.....	16	23/28	3.20	24	80

¹ Based on one crewman in H-19D, HU-1A, H-21C, and H-34A; and three crewmen in H-37A.

² Computed at 240 pounds per individual.

These figures are applicable for operations conducted at a *50-nautical mile radius*. Further reduction in payload is required for temperatures above 70° F., at higher altitudes, and as the operating radius increases. The payload reduction required for a specific mission is determined from the 1-series technical order for the respective aircraft.

(h) *Determination of transport helicopter requirements.*

1. Most helicopter operations will be of the short-haul type and may require that more than one round trip (sortie) be flown in support of the movement.
2. To determine the number of helicopters or units required to accomplish a given mission or the capabilities of helicopters on a specific mission, the staff planner should use the following formulas:

$$N = \frac{HS}{D}, \text{ when}$$

N = Number of round trips (sorties per aircraft per day). This figure must be the resultant next lower whole number if a fraction is involved; a sortie

must complete a round trip.¹

S = Average sortie speed of aircraft in knots. For planning purposes, use cruising speed unless some other speed is specified.

D = Round-trip distance in miles. This distance must be the actual distance flown rather than airline distance from origin to destination. If airline distance is used, add 15 percent to the airline distance to obtain estimated flight distance.

H = Represents the number of operational hours available.

$$O = \frac{T}{N \times P}, \text{ when}$$

O = Number of operational aircraft required or available daily.

¹ If service and fuel are available at both pickup and delivery points, one-half sortie can be computed as a lift. (A lift is the movement of a load from origin to destination.) This would require the helicopters to remain in the delivery point area for service, which is normally undesirable.

T = Tonnage to be moved or tonnage that can be moved.

P = Payload of type aircraft used.

$A = 1.5 \times O$, when

A = The number of aircraft required or available to carry out a sustained operation. (This formula applies the daily availability factor of 67 percent to O to obtain A or to A to obtain O .)

3. This method of determining helicopter requirements is particularly applicable to movement of supplies or troops when combat loading is not a factor to be considered. Aircraft for air-landed assault operations should be determined by the preparation of a planning worksheet. The planning worksheet develops loads to provide for tactical integrity of the combat units and combat loading of each aircraft. The method of determining aircraft requirements described herein can be used to *estimate* requirements for assault operations by adding 10 percent to the unit personnel and equipment tonnage to allow for combat loading.

4. *Examples.*

- (a) A division has been allocated 18 H-34 helicopters for a period of 3 days to assist in moving supplies from the field army supply points to the division distributing points. The round trip actual flight distance is 80 nautical miles. The division G4 desires to know what the daily lift capacity of this helicopter company will be for this mission.

Solve first for N (number of sorties per aircraft per day):

$$N = \frac{HS}{D}, N = \frac{4 \times 75}{80}, N = 3.75 \text{ or } 3 \text{ sorties per day.}$$

Solve next for O (number of operational aircraft available):

$$O = 90 \text{ percent of } A (18); O = 16 \text{ operational aircraft per day.}$$

Solve for T daily tonnage capability of available aircraft):

$$O = \frac{T}{N \times P}, 16 = \frac{T}{3 \times 2.1}, T = 100.8 \text{ short tons per day.}$$

- (b) The field army G4 has a requirement to move 300 short tons of cargo per day for 8 days from the field army service area to the 20th Infantry Division. Because of terrain and enemy action, this movement cannot be made by surface means. The G4 is computing the number of H-34's and/or helicopter companies that will be required to accomplish this mission. The estimated flight distance from the field army service area to the 20th Infantry Division distributing points is 28 nautical miles.

$$P = 2.1 \text{ short tons.}$$

$$T = 300 \text{ short tons.}$$

$$S = 75 \text{ knots.}$$

$$D = 56 \text{ nautical miles (round trip distance).}$$

$$N = \frac{4 \times 75}{56}, N = 5.3 \text{ or } 5 \text{ (sorties per aircraft).}$$

$$O = \frac{300}{5 \times 2.1}, O = 28.6 \text{ or } 29 \text{ (helicopters).}$$

$$A = 1.5 \times 29, A = 44 \text{ helicopters or approximately } 2 \text{ companies of}$$

H-34 helicopters plus
4 H-34 helicopters.

d. *Fixed-Wing Aircraft.*

(1) *General.* Army fixed-wing aircraft are limited in speed and range as compared with larger transport-type aircraft. The ability of Army fixed-wing aircraft to land and take off from selected small, unprepared areas permits the delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to larger aircraft. The ability of Army fixed-wing aircraft to fly slowly and maintain a high degree of maneuverability further enhances their value in forward areas under combat conditions.

(2) *Planning factors (fixed-wing).* (See also FM 101-10, part III, ch. 5, sec. V.)

(a) *Availability.* The operation plan should be based on the availability of 75 percent of the assigned aircraft for sustained operations. A higher availability ratio of approximately 95 percent may be obtained for operations of short duration (less than 6 days). This higher availability ratio will depend on the status of maintenance and inspections, repair parts, time available for maintenance, and degree of skill of maintenance personnel.

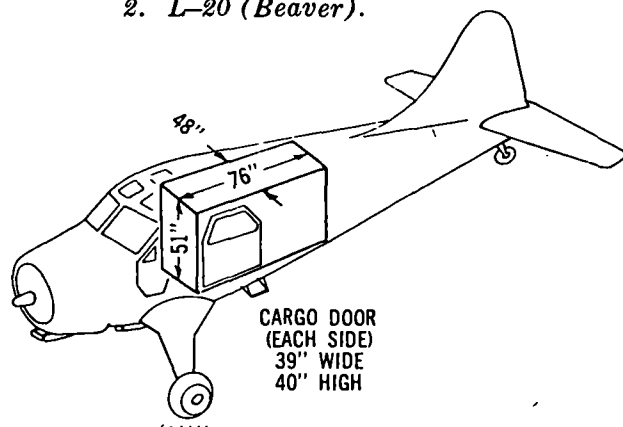
(b) *Cargo.*

1. Cargo may be delivered by three means: free-fall, parachute, or air-landed. The type of delivery utilized is normally requested by the receiving unit. The size and amount of cargo which may be loaded internally will be governed by the following:

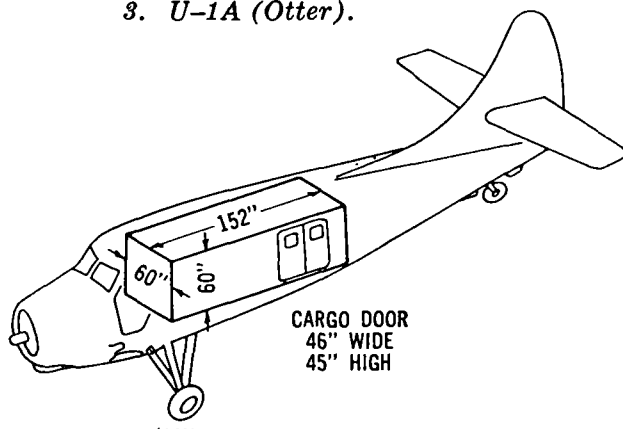
- (a) Size of compartment door.
- (b) Compartment door location with respect to the cargo compartment.
- (c) Size of cargo compartment.

(d) Lifting capability of the aircraft used.

2. *L-20 (Beaver).*



3. *U-1A (Otter).*



(c) *Landing facilities.* The development of a landing site is a continuous operation. Provisions must be made for an adequate site when planning aircraft movements. The minimum requirements for landing sites are as follows:

	1	2	3
		No-wind condition at sea level over 50-foot obstacle	
	Aircraft at maximum gross weight	Length (ft)	Width (ft)
1			
2	L-19.....	800	50
3	L-20.....	1,000	60
4	L-23D.....	3,000	60
5	U-1A.....	1,500	90

- (d) *Maintenance.* Under normal climatic conditions, no extensive facilities are required for organizational maintenance. Special equipment and facilities will be required when operating in extreme climatic conditions. Direct support field maintenance units are equipped for field operations under normal climatic conditions. Special considerations for equipment and facilities will be required under extreme conditions. For man-hour requirements for aircraft maintenance, applicable publications should be consulted.
- (e) *Hours of operation.* Based on a sustained operation, 6 hours' flying time per day per available airplane should be used as a planning factor.
- (f) *Loading time.*
Personnel:
Troops—approximately 2 to 3

minutes (dependent on type aircraft).

Casualties—10 minutes.

Cargo:

Internal in fuselage—dependent on type cargo, 10 to 30 minutes.

External beneath wings of airplane—approximately 10 minutes.

(g) *Unloading time.*

Personnel:

Troops—1 minute.

Casualties—10 minutes.

Cargo:

Internal in fuselage—approximately 5 minutes.

External—air-landed—10 minutes.

Parachute—30 seconds.

Free-fall—10 seconds.

(h) *Payload guidance.*

	1	2	3	4	5	6
	Model	Per aircraft ¹				
		Aircraft per company	Fully equipped troops ²	Recommended payload (tons)	Litter patients	Average cruising speed (knots)
1						
2	L-20.....		4	0.6	2 + 2 ambulatory	105
3	U-1A.....	16	8	1.1	6	100

¹ Based on 50-nautical mile radius of action.

² Computed at 240 pounds per individual.

- (i) *Determination of aircraft requirements.* See c(2)(h) above.

7.44. Air Force Transport Aircraft

a. For general considerations and procedures governing the employment of Air Force transport aircraft in joint operations, see FM's 100-5; 101-5; 57-30; 57-100; and 101-10, part III, chapter 5, section V.

b. In planning for joint airborne operations, the commander and staff officer should be familiar with the following basic terms:

- (1) *Allowable cargo load (air)*—the amount of cargo, determined by weight, cubic displacement, and dis-

tance to be flown, which may be transported by aircraft. In an airborne operation, the Air Force commander will announce the allowable cargo load for each type of aircraft. The allowable cargo load of an aircraft varies according to distance and certain other conditions. The greater the distance, the greater the weight of fuel and resultant reduced allowable cargo load. In radius operations, the allowable cargo load for the distance traveled for parachute operations generally is greater than that for air-landed operations because there is a necessary

safety restriction on the total weight of the aircraft on landing. The allowable cargo load for an aircraft can be determined for any range or radius by reference to graphs provided for that purpose.

- (2) *Radius of action*—the maximum distance to which an airplane can safely travel and return without refueling. Operations under radius conditions are those in which aircraft deliver troops or materiel at a destination and return without refueling.
- (3) *Range*—the distance from the takeoff point to the point where an airplane delivers its cargo load (safety margin of reserve fuel included). Refueling is required to return to the original takeoff point.

c. A general description of the various types of mobilization aircraft and their technical characteristics and performance data, to include cargo-distance graphs; cargo compartment di-

mensions; troop transport, litter transport, parachutist, and aerial delivery provisions, are contained in TM 57-210.

d. Planning data for determining Air Force transport aircraft requirements for movement of units of a type field army are contained in paragraph 4.12.

e. The following data are included for use as a guide to commanders and staff officers in computing type load requirements for airlifting Army aircraft in Air Force transport aircraft. Total requirements of Air Force transport aircraft necessary to lift complete TOE units may be determined by combining aircraft requirements based on the data below with the tabulated requirements for the aviation unit concerned in paragraph 4.12. The allowable cargo loads for Air Force aircraft used in determining the number of Army aircraft each can transport are those shown in paragraph 4.12b (3) and a 60,000-pound allowable cargo load for the C-133, heavy transport airplane. Space, however, rather than weight is the critical factor.

Type Loads for Airlifting Army Aircraft

	1	2	3	4	5	6
1	Air Force transport aircraft	Army aircraft			Total load ¹	
		Type	Number	Degree of disassembly	Pounds	Short tons
2	C-119	L-19	2	Wings and elevators	3,718	1.9
3	C-123	L-19	2	Wings and elevators	3,718	1.9
4	C-124	L-19	3	Wings	5,577	2.8
5	C-124	L-19	4	Wings and elevators	7,437	3.7
6	C-124	L-19	5	Four with wings, elevators, propellers, and landing gear off and one with only wings and elevators off.	9,296	4.7
7	C-130A	L-19	2	Wings and elevators	3,718	1.9
8	C-130A	L-19	4	Wings, elevators, propellers, and landing gear	7,437	3.7
9	C-133	L-19	3	Wings	5,577	2.8
10	C-133	L-19	5	Wings and elevators	9,296	4.7
11	C-133	L-19	7	Wings, elevators, propellers, and landing gear	13,014	6.5
12	C-119	L-20	1	Wings and elevators	3,527	1.8
13	C-123	L-20	1	Wings and elevators	3,527	1.8
14	C-124	L-20	2	Wings and elevators	7,056	3.5
15	C-124	L-20	4	Wings, elevators, propellers, and landing gear	14,112	7.1
16	C-130A	L-20	1	Wings and elevators	3,527	1.8
17	C-130A	L-20	2	Wings, elevators, propellers, and landing gear	7,056	3.5
18	C-133	L-20	4	Wings and elevators	14,112	7.1
19	C-133	L-20	5	Wings, elevators, propellers, and landing gear	17,634	8.8

See footnotes at end of table.

Type Loads for Airlifting Army Aircraft—Continued

1	1	2	3	4	5	6
	Air Force transport aircraft	Army aircraft			Total load ¹	
		Type	Number	Degree of disassembly	Pounds	Short tons
20	C-119	U-1A	-----	(²)	-----	-----
21	C-123	U-1A	-----	(²)	-----	-----
22	C-124	U-1A	2	Wings, elevators, propellers, and landing gear.....	10,752	5.4
23	C-130A	U-1A	1	Wings, elevators, propellers, and landing gear.....	5,376	2.7
24	C-133	U-1A	2	Wings, elevators, propellers, and landing gear.....	10,752	5.4
25	C-119	H-13	1	Blades.....	1,893	0.9
26	C-123	H-13	1	Blades.....	1,893	0.9
27	C-124	H-13	2	-----	3,786	1.9
28	C-130A	H-13	2	Blades and head.....	3,786	1.9
29	C-130A	H-13	3	Blades, head, and landing gear (two).....	5,679	2.8
30	C-133	H-13	2	-----	3,786	1.9
31	C-133	H-13	4	Blades.....	7,572	3.8
32	C-133	H-13	6	Blades and landing gear.....	11,358	5.7
33	C-119	H-19	1	Head, blades, landing gear, and tail cone.....	6,382	3.2
34	C-123	H-19	1	Head, blades, landing gear, and tail cone.....	6,382	3.2
35	C-124	H-19	2	Head, blades, and tail cone.....	12,764	6.4
36	C-130A	H-19	2	Head, blades, landing gear, and tail cone.....	12,764	6.4
37	C-133	H-19	2	Head and blades.....	12,764	6.4
38	C-133	H-19	4	Head, blades, and tail cone.....	25,528	12.8
39	C-119	H-21	-----	(²)	-----	-----
40	C-123	H-21	-----	(²)	-----	-----
41	C-124	H-21	1	Head, blades, and landing gear tilted or in two sections.....	10,416	5.2
42	C-130A	H-21	-----	(²)	-----	-----
43	C-133	H-21	1	Head, blades, and landing gear.....	10,416	5.2
44	C-119	H-23	1	Blades.....	2,016	1.0
45	C-123	H-23	1	Blades.....	2,016	1.0
46	C-124	H-23	2	-----	4,032	2.0
47	C-124	H-23	4	Blades.....	8,064	4.0
48	C-130A	H-23	2	Head and blades.....	4,032	2.0
49	C-130A	H-23	3	Two heads, blades, and landing gear and one head and blades.....	6,048	3.0
50	C-133	H-23	2	-----	4,032	2.0
51	C-133	H-23	4	Blades.....	8,064	4.0
52	C-133	H-23	6	Blades and landing gear.....	12,096	6.0
53	C-119	H-34	-----	(²)	-----	-----
54	C-123	H-34	-----	(²)	-----	-----
55	C-124	H-34	2	Head, blades, landing gear, tail pylon, and canopy assembly.....	17,987	9.0
56	C-130A	H-34	-----	(²)	-----	-----
57	C-133	H-34	2	Head, blades, landing gear, tail pylon, and canopy assembly.....	17,987	9.0
58	C-119	HU-1	1	Blades, landing gear, pylon, stabilizers, and main rotor mast.....	4,333	2.2
59	C-123	HU-1	1	Blades, landing gear, pylon, stabilizers, and main rotor mast.....	4,333	2.2
60	C-124	HU-1	2	Blades, landing gear, tail cone, and stabilizers.....	8,666	4.3
61	C-130A	HU-1	1	Blades, landing gear, pylon, stabilizers, and main rotor mast.....	4,333	2.2

¹ Includes an estimated 240 pounds per ton of aircraft for crating and cradling materials.

² Degree of disassembly required to transport in this aircraft is uneconomical.

Section VIII. INLAND WATERWAYS

7.45. General

a. Types. Inland waterways include all navigable inland waters such as rivers, lakes, inland channels, and canals of sufficient depth to accommodate cargo traffic. The following are the general types into which inland waterways are grouped:

- (1) Lakes.
- (2) Rivers.
- (3) Ship canals.
- (4) Barge canals.
- (5) Intracoastal waterways.

b. Characteristics. The characteristics of a waterway which must be considered in an analysis of its capabilities are as follows:

- (1) Restricting widths and depths of channel.
- (2) Vertical and horizontal bridge clearance.
- (3) Location of dams and other bars to navigation.
- (4) Location of locks, dimensions, and timing.
- (5) Seasonal floods and droughts, their frequency and duration.
- (6) Normal freezeup and opening dates.
- (7) Hazards to navigation, such as rapids and falls.
- (8) Speed and fluctuation of current.
- (9) Waterway maintenance requirements.
- (10) Changes of channel.

7.46. Waterway Capacity Estimates

a. Limiting Factors. Factors, other than waterway characteristics, having a limiting effect on waterway capacity are—

- (1) Availability of suitable barges or craft.
- (2) Availability of suitable operating personnel.
- (3) Availability and adequacy of terminals and terminal facilities.

b. Turnaround Time. This factor is defined as the time required for a barge or craft to load, travel to destination, unload, return to origin, and be ready to resume loading. It has

considerable effect on waterway capacity and involves—

- (1) Length of haul, taken as round-trip distance.
- (2) Speed in still water—4 miles per hour.
- (3) Speed and direction of current.
- (4) Loading and unloading time—computed at 8.4 short tons per barge per hour.
- (5) Time consumed in locks.
- (6) Operating hours per day—normally taken as 20, allocating the remaining four for maintenance, refueling, restoring, etc.

c. Capacity Determination, Craft Available To Fill or Exceed Waterway Capacity. When sufficient barges or craft are available to fill or exceed waterway capacity, the daily tonnage that may be moved over the waterway is equal to one-half the number of craft per day that can be passed through the most limiting constriction (for example, a lock, lift bridge, narrow channel, etc.) times the average net capability of the craft in use.

d. Capacity Determination, Craft Not Available To Fill or Exceed Waterway Capacity. The following formula may be used to determine the number of tons a given number of barges can transport a given distance daily:

$$\frac{\text{Number of barges} \times \text{tons per barge} \times \text{hours of operation per day}}{\text{Turnaround time in hours}} = \text{Tons moved daily.}$$

Example: Determine the daily tonnage 20 barges of 270 short tons capacity each can move 60 miles forward with no lost time in locks and negligible effect due to current.

$$\text{Travel time per barge} = \frac{60 + 60}{4} = 30 \text{ hours.}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 270}{8.4} = 64.3 \text{ hours.}$$

$$\text{Turnaround time per barge} = 30 + 64.3 = 94.3 \text{ hours.}$$

$$\frac{20 \text{ barges} \times 270 \text{ tons per barge} \times 20 \text{ hours daily availability}}{94.3 \text{ hours turnaround time}} = 1,145.3 \text{ short tons daily.}$$

7.47. Floating Equipment Requirements

a. *Cargo Craft.* To determine the number of barges or cargo craft required to move a given tonnage a given distance forward daily, use the following formula:

$$\frac{\text{Daily tonnage} \times \text{hours}}{\text{turnaround time}} = \text{Number barges required.}$$

$$\frac{\text{Tons per barge} \times \text{hours of operation}}{\text{daily}} = \text{Number barges required.}$$

Example: Determine the number of barges having a capacity of 500 short tons required to move 1,000 short tons daily a distance of 100 miles forward, assuming no lost time in locks and negligible effect due to current.

$$\text{Travel time per barge} = \frac{100 + 100}{4} = 50 \text{ hours.}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 500}{8.4} = 119 \text{ hours.}$$

$$\text{Turnaround time per barge} = 50 + 119 = 169 \text{ hours.}$$

$$\frac{1,000 \text{ tons daily} \times 169 \text{ hours turnaround}}{500 \text{ tons per barge} \times 20 \text{ hours daily operation}} = 16.9 \text{ barges} = 17 \text{ barges required.}$$

b. *Tugs and Towboats.* Since a single tug or towboat can normally be used to tow more than one barge and since loading time is not a consideration in tug or towboat availability, it follows that fewer tugs than barges will be required in any given situation. To determine the number of tugs or towboats required to efficiently operate a given number of barges in a given situation, use the following formula:

$$\frac{\text{Total number of barges} \times \text{turnaround time for tugs in days}}{\text{Number of barges per tow} \times \text{turnaround time for barges in days}} = \text{Number of tugs.}$$

Example: Determine the number of tugs required to operate 400 barges, when each tow consists of five barges, turnaround time for barges is 4 days, and turnaround time for tugs is 2 days.

$$\frac{400 \text{ barges} \times 2 \text{ days tug turnaround}}{5 \text{ barges per tow} \times 4 \text{ days barge turnaround}} = 40 \text{ tugs required.}$$

Section IX. OCEAN SHIPPING

7.48. Definition of Ship-Loading Terms

a. Units of Weight.

- (1) Short ton (STON)—2,000 pounds. Used by U.S. ships in domestic trade.
- (2) Long ton (LTON)—2,240 pounds. Used by U.S. ships in foreign trade.
- (3) Metric ton—2,205 pounds. Used by foreign shipping.

b. Units of Volume.

- (1) Measurement ton (MTON)—40 cubic feet. Used by U.S. ships in foreign trade.
- (2) Register ton—100 cubic feet. (This tonnage is used for working out a basis to collect entry fees for the vessel and has no direct bearing on the cargo-carrying capacity of the vessel.)

c. Units of Distance and Speed.

- (1) *Distance*—nautical mile = 6,080 feet.
- (2) *Speed*—knot = 1 nautical mile per hour.

d. *Gross Tonnage.* Gross tonnage (gross register tonnage) is the entire internal cubic capacity of a ship expressed in register tons of 100 cubic feet each.

e. *Net Tonnage.* Net tonnage (net register tonnage) of a ship represents the cargo and passenger-earning spaces which remain after deduction from the gross tonnage of space for the crew, powerplant, fuel, and operation of the vessel. Net tonnage is expressed in tons of 100 cubic feet each.

f. *Deadweight Tonnage.* Deadweight tonnage is the carrying capacity of a ship expressed in long tons and represents the difference between displacement loaded to maximum draft allowed by law and displacement light.

g. *Displacement Tonnage Light.* Displacement tonnage light is the weight of a ship in long tons and excludes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

h. Displacement Tonnage Loaded. Displacement tonnage loaded is the weight of a ship in long tons and includes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use of an voyage.

i. Cargo Deadweight Tonnage. Cargo deadweight tonnage is the weight-lifting capacity of a ship in long tons remaining after deducting from the deadweight tonnage the weight of fuel, water, stores, dunnage, and such other items as may be necessary for a voyage.

j. Grain Cubic Capacity. Grain cubic capacity is the maximum space available for cargo measured in cubic feet, the measurements being taken to the inside of the shell plating of the ship or to the outside of the frames and to the top of the beams or underside of the deck plating. If a bulk cargo of grain was loaded, it would flow in between the frames and beams and occupy the maximum space available. This is the grain cubic capacity.

k. Bale Cubic Capacity. Bale cubic capacity of a ship is the number of cubic feet of space available for cargo measured to the inside of the cargo battens, on the frames, and to the underside of the beams.

l. Lost Space. Lost space (broken stowage, stowage loss) is the difference between the ship's cubic measurement and total measurement of the cargo. Although allowance for lost space varies a great deal with individual types of cargo, the average allowance for the entire spread of military cargo amounts to the following, which is given in percentage of bale cubic capacity.

	Percentage
(1) Administrative loading	20
(2) Commodity loading	30
(3) Combat loading	50
(4) Selective loading	30

m. Stowage Factor. A stowage factor is a relationship of cubage to weight. As applied to cargo, it is the ratio of the number of cubic feet of space occupied by the cargo to the weight of the cargo in long tons. The units in which a stowage factor is expressed are stated as "cubic feet per long ton." In individual items or types of cargo, it is the amount of cubic feet of space occupied by 1 long ton.

n. Vessel Stowage Factor. Vessel stowage factor = (bale cubic capacity—estimated lost space) ÷ (cargo deadweight tonnage—estimated weight of deck cargo).

- (1) To determine whether weight or volume of a specific commodity will be the limiting factor in loading a Liberty-type ship of 400,000 cubic feet capacity after deducting lost space and with a cargo capacity tonnage (less deckload) of 8,000 long tons.

$$\begin{aligned}\text{Vessel factor} &= \frac{400,000 \text{ cubic feet}}{8,000 \text{ long tons}} \\ &= 50 \text{ cubic feet/} \\ &\quad \text{long ton}\end{aligned}$$

- (2) Under the conditions stated above, the vessel will have its cargo space completely filled and its weight capacity utilized if stowed with cargo occupying 50 cubic feet to the long ton. In this example, for cargo occupying more than 50 cubic feet per long ton, volume will be the limiting factor. For cargo occupying less than 50 cubic feet per long ton, weight will be the limiting factor.

7.49. Shipping References

- a. NWIP 11-21 (USN), Logistic Reference Data (Classified).*
- b. LFM 11 (USMC), Embarkation and Ship Loading (1949).*
- c. FM 60-30, Amphibious Operations: Embarkation and Ship Loading (Unit Loading Officer).*

7.50. Commercial Loading Methods

a. Bulk and General Cargo Loading. Bulk and general cargo loading is the stowage of supplies to utilize the entire carrying capacity of a ship, disregarding segregation of cargoes either by class, technical service, or commodity. It permits maximum economy in shipping space but requires additional labor and facilities at destination for segregation and assembly of supplies for use.

b. Multiple Port Discharge. Multiple port discharge utilizes bulk stowage of supplies for

more than one destination, loaded to maintain availability for discharge of proper items in the order of arrival at the ship's scheduled destinations.

7.51. Military Loading Methods

Military cargo is loaded on board ships according to its intended employment at its destination. There are four distinct types of military loading.

a. Combat Loading. Combat loading gives primary consideration to the facility with which troops, equipment, and supplies can be unloaded and ready for combat on landing, rather than to economical utilization of ship space. There are three methods of combat loading. They differ mainly as to the degree of availability of troop units for landing and as to the tactical integrity of the units.

- (1) *Combat unit loading.* Combat unit loading is the loading of an assault troop unit, together with its essential combat equipment and supplies, in a single ship in such a manner that the unit will be available to support the tactical plan upon debarkation and to provide for maximum of flexibility to meet possible changes in the tactical plan.
- (2) *Combat organizational loading.* Combat organizational loading is the loading of a troop unit with its equipment and supplies on the same ship, but without regard to tactical considerations upon debarkation. It permits debarkation of complete units and equipment which are available for employment after assembly ashore. This method is more economical in ship space than combat unit loading.
- (3) *Combat spread loading.* Combat

spread loading is the loading of some of the troops, equipment, and initial supplies of a unit on one ship and the remainder on one or more ships. This method is commonly used with troop units with heavy equipment. Units so loaded are available for employment when landed at established beachheads or ports after a lapse of time necessary to assemble them on land with their equipment and supplies.

b. Administrative Loading. Administrative loading is a method of loading troops and/or equipment and supplies in a ship for maximum utilization of personnel and cargo space. No consideration is given to debarkation priorities. Therefore, equipment and supplies must be unloaded and sorted before they can be used. This type loading may be employed effectively for reinforcing and maintaining an expeditionary force and for carrying supplies and equipment for the buildup forces.

c. Commodity Loading. Commodity loading is a method of loading in which various types of cargo, such as ammunition, rations, or boxed vehicles, are loaded together in order that each commodity can be discharged without disturbing the others.

d. Selective Loading. Selective loading is the arrangement and stowage of equipment and supplies aboard a ship in a manner designed to facilitate issue to units. Specific items may be discharged on call.

7.52. Nomenclature of Maritime Commission Oceangoing Vessels

Note. There is such a large difference in the cubic-carrying capacity of vessels of the same type, because of various alterations and special fittings, that the cubic feet and tonnage figures shown in the tables in this paragraph and in paragraph 7.53 are, in most instances, minimum and apply to one type of the designated vessels only.

1	2	3
Type	Deadweight tonnage	Remarks
B7	5,700	Concrete hull, cargo barge, nonpropelled.
C1-A	7,400	Designed for general cargo in world trade; steam turbine and motor-propelled (two modifications).
C1-B	9,100	Designed for general cargo in world trade; steam turbine and motor-propelled (three modifications).
C1-M	5,000	Designed for general cargo; motor-propelled.
C1-S	5,000	Concrete ship designed for cargo purposes; steam-reciprocating-engine propelled.
C2	9,300	Designed for general cargo in world trade; majority steam-turbine propelled (several modified types). Modified types were used mostly as hospital ships in World War II.
C3	9,900	Combination passenger and cargo ship; majority steam-turbine propelled (several modified types).
C3-S	12,300	Designed for cargo; steam-turbine propelled.
C4	15,000	Designed for cargo; steam-turbine propelled (two modifications).
C4-S-1a	12,900	Mariner class vessel. Developed by Maritime Administration in cooperation with the Department of Defense to provide modern high-speed commercial-type vessels which can readily be converted for wartime shipping.
EC2	10,800	Liberty-type designed for general cargo; steam-reciprocating-engine propelled. Several modified types, prefixed by the symbol Z, were designed as tank carriers and later modified as plane carriers.
L6	15,700	Specially designed for bulk ore, coal, or grain trade on the Great Lakes; steam-reciprocating-engine propelled.
N3	2,800	Cargo carrier designed for coastal trade; steam-reciprocating-engine propelled.
P1	1,900	Specially designed passenger-type vessel; steam-turbine propelled.
P2	10,000-12,000	Designed to carry troops. Two types, one turbine-electric propelled, one steam-turbine propelled.
T1	1,500-4,200	Designed for tanker service in coastal and inland waters; diesel-propelled (four modifications).
T2	16,000	Designed to carry bulk oil in world trade; turbo-electric propelled (four modifications).
T3	16,500	Designed to carry bulk oil in world trade; steam-turbine propelled (six modifications).
V4	800	Large diesel-powered oceangoing tug.
VC2	10,200	Victory-type designed to carry cargo in world trade. Four types: one has 6,000 HP engine; three have 8,500 HP engines. Three are steam-turbine propelled; one diesel-propelled.

7.53. Cargo Vessel Characteristics

a. Physical Characteristics.

1	2	3	4	5	6	7
Vessel	Gross register tonnage	Overall length (ft)	Beam (ft)	Sustained speed (knots)	Cruising range (nautical mi)	Summer draft (ft)
Liberty.....	7,100	442	57	11.0	19,000	28
Victory.....	7,600	455	62	15.5	23,000	29
C1-B Cargo.....	6,700	418	60	14.0	24,000	28
C2 Cargo.....	6,181	459	63	15.0	16,000	26
C3 Cargo.....	7,900	492	70	16.5	11,700	29
C4 Cargo.....	10,780	520	71	17.0	9,000	33
FS Freighter ²	560	176	32	12.0	4,000	12
C1-M-AV1 Freighter.....	3,805	339	50	11.0	25,000	21
T2-SE Tanker.....	10,200	524	68	14.5	12,600	30
ZET 1 Tanker ³	7,000	442	57	11.0	17,000	28
C4 Mariner.....	9,200	564	76	20.0	23,000	30

See footnotes at top of page 328

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¹ Cruising range can be increased to 18,000 miles if deep tanks are used for fuel oil. See footnote 2 in c below.

² FS type (freight service ship) is the 176-foot vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

³ Converted Liberty.

b. Hold, Hatch, and Boom Data.

	1	2	3	4	5	6
1	Vessel	Cargo holds (number)	Boom capacity (LTON)	Booms (number)	Capacity heavy lift rigs (LTON)	Hatches with heavy lift booms (number)
2	Liberty.....	5	5	12	¹ 50-15	2-4
3	Victory.....	5	5	16	¹ 50-30	¹ 3-4
4	C1-B Cargo.....	5	5	15	30	2
5	C2 Cargo.....	5	5	17	50	3
6	C3 Cargo.....	5	5-10	21	30	5
7	C4 Cargo.....	7	5	24	50	4-5
8	FS Freighter ²	2	5	5	15	2
9	C1-M-AV1 Freighter.....	4	³ 3-5	12	30	2-3
10	C4 Mariner.....	7	5-10	26	60	4-6

¹ Some Libertys have a 30-ton boom at No. 2 hatch and a 15-ton boom at No. 4 hatch. Other Liberty ships have a 50-ton boom at No. 2 hatch and a 30-ton boom at No. 4 hatch. All Victories have a 30-ton boom at No. 4 hatch.

² FS type (freight service ship) is the 176-foot vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

³ Two 3-ton booms (No. 4 hatch) and ten 5-ton booms.

c. Vessel Capacities.

	1	2	3	4	5	6	7
1	Vessel	Deadweight (LTON)	MTON ^{1 2}	Bale cubic capacity (cu ft) ^{1 2}	Grain cubic capacity (cu ft) ¹	Refrg cargo (cu ft)	Liquid cargo (bbl)
2	Liberty.....	10,800	11,886	475,444	563,257	-----	-----
3	Victory.....	10,800	11,413	456,525	528,325	-----	-----
4	C1-B Cargo.....	9,100	11,300	452,000	508,000	-----	-----
5	C2 Cargo.....	9,250	11,823	472,935	548,560	-----	-----
6	C3 Cargo.....	12,300	18,425	736,980	815,470	³ 45,000	-----
7	C4 Cargo.....	14,863	17,790	672,240	727,430	⁴ 32,375	-----
8	FS Freighter.....	470	483	19,320	21,462	-----	-----
9	C1-M-AV1.....	5,032	5,699	227,930	250,000	9,830	4,000
10	T2-SE Tanker.....	16,583	381	15,230	-----	-----	141,000
11	ZET-1 Tanker ⁵	10,800	-----	-----	-----	-----	65,000
12	Supertanker ⁶	25,000	-----	-----	-----	-----	165,000
13	C4 Mariner.....	12,900	18,418	736,723	837,305	30,254	-----

¹ On-deck space or lost space in stowage not included.

² Does not include capacity of deep tanks of which the Liberty-type ship has three. Deep tanks No. 1 and No. 2, with approximately 16,000 cubic feet of capacity, may be used for dry or liquid cargoes if not in use for vessel voyage requirements. No. 3 deep tank is rigged for either fuel oil or bulk cargo liquids. A 5,000-barrel (703 LTON) payload can be shipped in this tank if the contemplated voyage is to be short enough that No. 3 tank will not be needed for fuel oil.

³ Standard C3 has no refrigerated cargo capacity; figure given is for C3 passenger and cargo type.

⁴ Standard C4 has no refrigerated cargo capacity; figures given are for C4-S-A4 type.

⁵ Modified Liberty.

⁶ Supertankers are those tankers of over 25,000 DWT, which run up to 100,000 DWT or higher.

d. Detailed Capacities Below Deck.

1	1	2	3	4	5	6
	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons		
				Hold	Tween deck ¹	Deep tanks
2	Liberty.....	1	34' 4" x 20' 0".....	902.0	983.0	415
		2	35' 0" x 20' 0".....	2,300.0	1,065.7	0
		3	20' 0" x 20' 0".....	1,494.7	597.5	0
		4	35' 0" x 20' 0".....	1,315.0	742.0	0
		5	35' 0" x 20' 0".....	1,289.0	771.5	0
	Total.....			7,300.7	4,159.7	415
3	FS Freighter.....	1	16' 0" x 20' 0".....	251.0	0	0
		2	16' 0" x 28' 0".....	285.0	0	0
	Total.....			536.0	0	0

¹ Known as the "fo'c'sle."

1	1	2	3	4	5	6	7
	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons			
				Hold	Upper tween deck ¹	Lower tween deck ¹	Deep tanks
2	Victory.....	1	22' 4" x 25' 0".....	698	468	594	0
		2	22' 4" x 24' 0".....	699	675	545	0
		3	22' 4" x 36' 0".....	1,321	1,111	942	0
		4	22' 4" x 36' 0".....	1,278	1,230	0	0
		5	22' 4" x 24' 0".....	647	1,091	0	0
	Total.....			4,643	4,575	2,081	0
3	C1-B.....	1	25' 3" x 20' 6".....	862	481	398	0
		2	31' 6" x 20' 0".....	1,437	750	741	0
		3	31' 6" x 20' 0".....	1,222	845	779	0
		4	31' 6" x 20' 0".....	1,205	780	0	480
		5	31' 6" x 20' 0".....	608	574	0	0
	Total.....			5,334	3,430	1,918	480
4	C1-M-AV1.....	1	19' 11" x 20' 2".....	615	0	601	0
		2	19' 11" x 40' 5".....	1,378	0	982	0
		3	19' 11" x 40' 5".....	1,179	0	906	0
		4	8' 0" x 8' 0".....	113	0	168	0
	Total.....			3,285	0	2,657	0

See footnotes at end of table.

	1	2	3	4	5	6	7
1	Ship type	Hatch No.	Hatch dimensions	Cargo capacities in measurement tons			
				Hold	Upper tween deck ¹	Lower tween deck ¹	Deep tanks
5	Mariner-----	1	24' 3" x 18' 6"-----	305	402	453	0
		2	30' 0" x 24' 0"-----	637	731	865	0
		3	40' 0" x 30' 0"-----	1,284	1,050	1,454	0
		4	40' 0" x 30' 0"-----	1,528	1,006	1,500	0
		5	40' 0" x 30' 0"-----	401	1,044	410	953
		6	40' 0" x 30' 0"-----	1,646	965	0	298
		7	25' 0" x 30' 0"-----	856	627	0	0
	Total-----			6,657	5,825	4,682	1,251

¹ Known as the "focals."

e. Composition of Deadweight Tonnage. Five types comprise the majority of all shipping available for military use. Further detailed data for these vessels follow. It is to be noted that ships' capacities are expressed in long tons in order to agree with normal shipping procedures; whereas, the discharge and loading capabilities of Transportation Corps terminal service companies are expressed in short tons in order to agree with practices of other means of transportation.

	1	2	3	4
1	Vessel	Maximum ship-operating supplies ¹ (LTON)	Cargo capacity tonnage when operating supplies (LTON) are maximum ¹	Total (LTON)
2	Liberty-----	2,800	8,000	10,800
3	Victory-----	3,100	7,500	10,600
4	C1-B-----	1,850	7,250	9,100
5	C1-M-AV1-----	1,047	6,393	7,440
6	Mariner-----	4,065	9,353	13,418

¹ Operating supplies include fuel, water, dunnage, and ship stores. Additional payload capacity may be substituted to a limit dependent on length of voyage and character of cargo, which will warrant a reduction in such ship-operating supplies.

f. Vehicle Loading Capacities.

	1	2	3	4	5	6	7	8	9	10	11
1	Vessel	Trucks, utility, ½-ton, 4×4 ¹		Trailers, cargo 1½-ton, 2-wheel ¹		Trucks, cargo, ¾-ton, 4×4 ¹		Trucks, cargo, 2½-ton, 6×6, LWB		Trucks, cargo, 5-ton, 6×6, LWB	
		On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ²	On wheels	Crated ²
2	Liberty-----	498	2,078	404	4,493	312	744	185	357	102	-----
3	Victory-----	512	1,983	512	4,287	331	710	193	340	114	-----
4	C1-B-----	511	1,912	491	4,133	337	684	182	328	145	-----
5	C1-M-AV1-----	314	645	261	456	167	280	111	114	61	-----
6	Mariner-----	1,181	1,740	891	1,732	665	966	364	328	229	-----

¹ Double the number of ¾-ton trucks on wheels can be stowed if they are stacked. It also is estimated that at least 35 percent more 1½-ton trailers can be loaded if stowed in tandem with drawbar nested inside body of preceding trailer, providing tailgates are drop-type. Regarding the other three types of vehicles, more can be stowed in the Liberty ship by double-decking; see note to C1-B table in *g* below.

² All crated vehicles are boxed by single units except the 1½-ton trailers, which are boxed by twin units.

³ The 5-ton truck, M54, is not shipped crated.

⁴ One hundred fifty-three ¾-ton trucks may be loaded in the bodies of 153 of these trucks. The other 32 trucks will not take jeeps because of the limiting height of the compartments in which stowed. As an alternative, a total of 215 trucks can be stowed by double-decking in Nos. 2 and 3 holds.

g. Detailed Vehicle Loading Capacities (stowed on wheels).¹

C1-B*						
1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ½-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
1	On deck.....	14	14	12	5	7
	Upper 'tween deck.....	21	18	12	6	4
	Lower 'tween deck.....	21	18	12	6	5
	Lower hold.....	14	13	9	4	4
2	On deck.....	25	21	18	12	7
	Upper 'tween deck.....	46	37	25	13	12
	Lower 'tween deck.....	42	37	25	15	12
	Lower hold.....	34	36	21	13	11
3	On deck.....	23	21	14	10	5
	Upper 'tween deck.....	44	42	30	17	12
	Lower 'tween deck.....	41	42	28	13	12
	Lower hold.....	41	42	28	13	9
4	On deck.....	21	21	14	10	7
	Upper 'tween deck.....	39	41	26	14	12
	Lower 'tween deck.....	36	37	24	12	10
	On deck.....	16	18	12	7	5
5	'Tween deck.....	23	23	15	7	5
	Hold.....	10	10	12	6	6
	On deck.....	22	22	14	9	6

* Number of vehicles (except 5-ton, 6 x 6) in lower holds of Nos. 2 and 3 hatches can be doubled by flooring over one layer of vehicles and loading a second layer directly on top. The depth of only these two holds will permit such double-decking.

¹ There are no available aircraft data for the Liberty, Victory, and C1-B ships since their holds are not adaptable to plane stowage; consequently, they are seldom used for this purpose.

Liberty Ship						
1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ½-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
1	'Tween deck.....	28	27	23	12	8
	Lower hold.....	28	24	18	10	5
	On deck.....	41	36	20	13	8
2	'Tween deck.....	54	44	30	21	12
	Lower hold.....	48	42	* 30	* 18	12
	On deck.....	22	14	10	6	4
3	'Tween deck.....	36	28	25	14	6
	Lower hold.....	32	28	* 22	* 12	6
	On deck.....	31	20	16	11	8
4	'Tween deck.....	41	37	27	16	8
	Lower hold.....	20	15	18	10	2
	On deck.....	31	22	14	11	6
5	'Tween deck.....	44	34	25	16	9
	Lower hold.....	20	11	20	6	2
	On deck.....	14	12	6	5	4

* Based on no centerline bulkhead, which may or may not be standard equipment.

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Victory Ship

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ¼-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
1	Upper 'tween deck	15	16	9	5	0
	Lower 'tween deck	16	18	9	6	3
	Hold	15	13	8	4	3
	On deck	18	16	12	7	4
2	Upper 'tween deck	29	26	17	10	4
	Lower 'tween deck	25	24	17	10	5
	Hold	21	21	14	8	3
	On deck	25	29	18	13	8
3	Upper 'tween deck	48	48	29	17	12
	Lower 'tween deck	46	46	30	18	12
	Hold	44	46	30	18	8
	On deck	23	25	18	13	8
4	'Tween deck	49	48	34	16	14
	Hold	49	49	31	18	13
	On deck	25	25	17	6	4
5	'Tween deck	30	31	20	12	6
	Hold	20	19	12	7	3
	On deck	20	14	13	7	4

C1-M-AV1

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ¼-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
1	'Tween deck	30	23	16	10	3
	Hold	16	13	7	4	2
	On deck	30	24	18	10	8
2	'Tween deck	51	46	28	19	10
	Hold	51	45	28	19	10
	On deck	28	22	14	10	6
3	'Tween deck	44	37	27	17	9
	Hold	44	37	26	15	9
	On deck	20	20	11	7	4

Mariner

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ¼-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
1	Upper 'tween deck	20	16	12	6	4
	Lower 'tween deck	14	10	9	4	0
	Hold	9	5	6	3	0
	On deck	33	23	20	10	7

Mariner—Continued

1	2	3	4	5	6	7
Hatch No.	Location	Trucks, utility, ¼-ton, 4 x 4	Trailers, cargo, 1½-ton, 2-wheel	Trucks, cargo, ¾-ton, 4 x 4	Trucks, cargo, 2½-ton, 6 x 6, LWB	Trucks, cargo, 5-ton, 6 x 6, LWB
2	Upper 'tween deck	37	23	22	11	7
	Lower 'tween deck	26	21	15	9	7
	Hold	15	11	9	5	2
	On deck	52	42	30	20	10
3	Upper 'tween deck	61	48	38	25	13
	Lower 'tween deck	52	44	32	21	13
	Hold	36	32	22	14	9
	On deck	52	36	26	18	10
4	Upper 'tween deck	69	46	38	20	14
	Lower 'tween deck	69	46	38	20	14
	Hold	56	44	30	16	12
	On deck	54	36	28	20	12
5	Upper 'tween deck	72	56	42	18	14
	Lower 'tween deck	74	58	44	¹ 18	¹ 14
	Hold	72	56	42	¹ 16	¹ 12
	Deep tank	36	28	14	6	2
	On deck	54	40	30	20	12
6	'Tween deck	65	47	36	18	14
	Hold	34	30	20	12	9
	Deep tank	10	4	0	0	0
	On deck	37	27	22	12	7
7	'Tween deck	42	33	23	11	7
	Hold	10	9	6	4	0

¹ On nonrefrigerated type only. Approximately three 5-tons or four 2½-tons can be loaded in these decks on refrigerated-type vessels.

Note. The figures contained in the preceding charts reflect general loading conditions and by no means represent the maximum vehicle capacities of the type vessels. With the exception of crated vehicles, no

allowance has been made for stacking or double-decking. All below-deck stowage is fore and aft, except in the case of ¼-ton trucks and 1½-ton trailers, which are stowed both fore and aft and athwartship.

7.54. Approximate Sailing Distances in Nautical Miles

Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
<i>United States</i>							
Boston		200	900	2,000	15,100	15,400	16,200
New York	200		600	1,700	14,900	15,300	16,000
Charleston	900	600		1,200	14,500	14,900	15,600
New Orleans	2,000	1,700	1,200		14,300	14,700	15,500
Los Angeles	15,100	14,900	14,500	14,300		400	1,100
San Francisco	15,400	15,300	14,900	14,700	400		800
Seattle	16,200	16,000	15,600	15,500	1,100	800	
<i>North Atlantic</i>							
Newfoundland, St. John's	900	1,100	1,700	2,600	15,700	16,000	16,800
Greenland, Ivigtut	1,700	1,900	2,400	3,400	16,500	16,800	17,600
Iceland, Reykjavik	2,300	2,500	3,000	4,000	17,100	17,400	18,200

See footnotes at end of table.

Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
<i>Europe</i>							
United Kingdom:							
Liverpool.....	3,000	3,200	3,700	4,700	17,600	17,900	18,700
Southampton.....	3,000	3,200	3,600	4,600	17,500	17,800	18,600
Northern Ireland, Belfast.....	2,900	3,000	3,400	4,400	17,200	17,500	18,300
Norway, Oslo.....	3,900	4,100	4,400	5,300	18,200	18,600	19,400
Russia:							
Archangel.....	4,000	4,200	4,800	5,800	18,800	19,200	10,000
Murmansk.....	3,700	3,800	4,400	5,400	18,500	18,900	19,700
France:							
Le Havre.....	3,000	3,200	3,600	4,600	17,500	17,800	18,600
Brest.....	2,900	3,100	3,500	4,500	17,400	17,700	18,500
Bordeaux.....	3,000	3,200	3,700	4,700	17,600	17,900	18,700
Belgium, Antwerp.....	3,200	3,400	3,800	4,800	17,700	18,000	18,800
<i>Mediterranean</i>							
France, Marseille.....	23,700	23,900	24,300	25,300	18,000	18,200	19,000
Italy, Naples.....	24,000	24,200	24,600	25,600	18,300	18,500	19,300
Algeria, Algiers.....	23,400	23,600	24,000	25,000	17,700	18,000	18,800
Strait of Gibraltar.....	3,000	3,200	3,600	4,600	17,300	17,500	18,300
<i>Caribbean and South Atlantic</i>							
Bermuda, Hamilton.....	700	700	800	1,700	14,600	14,900	15,800
Puerto Rico, San Juan.....	1,500	1,400	1,100	1,500	13,900	14,300	15,100
Trinidad, Port of Spain.....	2,000	1,900	1,700	2,100	14,100	14,400	15,300
Brazil, Rio de Janeiro.....	4,700	4,800	4,700	5,200	17,200	17,600	18,400
Argentina, Buenos Aires.....	5,800	5,900	5,800	6,300	18,300	18,700	19,600
Panama Canal, Panama.....	2,200	2,000	1,600	1,400	2,900	13,200	4,000
<i>Middle East</i>							
Egypt, Port Said.....	24,900	25,100	25,500	26,500	19,200	19,500	10,300
Arabia, Aden.....	26,300	16,500	26,900	27,900	10,600	10,900	11,700
Turkey, Istanbul.....	24,800	25,000	25,400	26,400	19,100	19,400	10,200
Iran, Khorramshahr (Persian Gulf).....	28,300	28,500	28,900	29,800	12,600	12,900	13,700
<i>North Pacific</i>							
Alaska, Dutch Harbor.....	17,400	17,300	16,900	16,700	2,400	2,100	1,700
<i>Middle Pacific</i>							
Hawaiian Islands, Honolulu.....	16,900	16,700	16,300	16,100	2,200	2,100	2,400
Marshall Islands, Kwajalein.....	19,200	19,000	18,600	18,400	4,200	4,410	4,500
Mariana Islands, Guam.....	10,200	10,000	19,600	19,400	5,600	5,100	4,900
Japan, Yokohama.....	19,900	19,600	19,500	19,100	4,800	4,500	4,200

See footnotes at end of table.

Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
<i>Southwest Pacific</i>							
New Guinea, Finschhafen.....	¹ 10,200	¹ 10,000	¹ 9,600	¹ 9,400	6,100	5,900	6,000
Philippine Islands, Manila.....	¹ 11,600	¹ 11,300	¹ 11,000	¹ 10,800	6,600	6,300	6,100
Australia:							
Brisbane.....	¹ 9,900	¹ 9,600	¹ 9,300	¹ 9,100	6,300	6,200	6,500
Melbourne.....	¹ 10,100	¹ 9,900	¹ 9,500	¹ 9,400	7,000	7,000	7,300
Malaya, Singapore.....	² 9,900	¹ 10,100	² 10,500	² 11,500	7,900	7,500	7,100
<i>China-India-Burma</i>							
China:							
Shanghai.....	¹ 10,800	¹ 10,600	¹ 10,200	¹ 10,000	5,700	5,400	5,100
Hong Kong.....	¹ 11,400	¹ 11,200	¹ 10,800	¹ 10,600	6,400	6,000	5,700
India:							
Bombay.....	² 8,000	² 8,200	² 8,600	² 9,500	¹ ² 12,200	¹ ² 12,600	¹ ² 13,400
Calcutta.....	² 9,600	² 9,800	² 10,200	² 11,200	¹ ² 13,900	¹ ² 14,200	¹ ² 15,000
Burma, Rangoon.....	² 9,600	² 9,800	² 10,200	² 11,200	¹ ² 13,900	¹ ² 14,200	¹ ² 15,000
East Russia, Vladivostok.....	¹ 9,500	¹ 9,300	¹ 8,900	¹ 8,700	9,000	8,600	8,200
					5,000	4,600	4,400

¹ Via Panama Canal.² Via Strait of Gibraltar.

7.55. Shipping Turnaround Times

a. *General.* Turnaround time for similar-type ships seldom will be the same between two ports, or other equidistant runs, unless sailings are carefully controlled. Assuming controlled operating conditions, a basis for turnaround times can be established for type ships (troop or cargo) for general planning purposes.

b. *Turnaround Time Components.* Turnaround time components are—

- (1) Loading time at home port.
- (2) Steaming time to and from destination.
- (3) Unloading and loading time at destination.
- (4) Unloading time at home port.
- (5) Normal voyage repair and reoutfitting time.

c. *Planning Factors.*

- (1) *Sailing distances per day.*¹

(a) *Cargo ships.*

1. Slow—240 nautical miles.
2. Fast—360 nautical miles.

(b) *Passenger ships.*

1. Slow—360 nautical miles.
2. Fast—432 nautical miles.

(2) *Time in ports per round trip for unloading, loading, voyage repairs, and reoutfitting.*

(a) Cargo ships—35 days.

(b) Troop ships—20 days.

(c) Tankers—10 days.

(3) *Convoys and effect on turnaround time.* A major portion of shipping may be conducted in convoy formation, the speed of which is dictated by the slowest vessel in each convoy. This factor must be considered when computing turnaround time for convoy or escorted shipping.

¹ For convoy sailing speed of advance, deduct 10 percent for delays in forming convoys, zigzagging en route, etc. The 10 percent loss factor is not applicable to ships in the "fast" category since such ships will normally proceed individually.

d. Table.

Ports	Ports of embarkation ¹													
	Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
	Type of shipping													
	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
<i>United States</i>														
Boston.....									48	72	50	74	54	82
New York.....									46	70	49	74	53	80
Charleston.....									45	67	47	71	51	77
New Orleans.....									44	67	46	69	51	77
Los Angeles.....	48	72	46	70	45	67	44	67						
San Francisco.....	50	74	49	74	47	71	46	69						
Seattle.....	54	82	53	80	51	77	51	77						
<i>North Atlantic</i>														
Newfoundland, St. John's.....			27	40	30	45	36	53	55	82	57	85	61	92
Greenland, Ivigtut.....	30	45	31	47	35	52	41	61	60	89	62	92	66	100
Iceland, Reykjavik.....	34	50	35	52	38	57	44	67	63	95	65	97	70	106
<i>Europe</i>														
United Kingdom:														
Liverpool.....	38	57	39	59	43	64	49	73	66	100	68	102	73	110
Southampton.....	38	57	39	59	42	63	48	72	66	99	68	102	72	109
Northern Ireland, Belfast.....	38	56	38	57	41	61	47	70	64	96	66	99	71	106
Norway, Oslo.....	44	66	45	68	47	70	52	78	70	105	72	109	77	116
Russia:														
Archangel.....	44	67	46	69	49	74	55	83	73	111	76	114	81	122
Murmansk.....	43	64	43	65	47	70	53	80	72	108	74	112	79	119
France:														
Le Havre.....	38	57	39	59	42	63	48	72	66	99	68	102	72	109
Brest.....	38	56	39	58	41	62	48	71	65	97	67	101	72	108
Bordeaux.....	38	57	39	59	43	64	49	73	66	100	68	102	73	110
Belgium, Antwerp.....	39	59	41	61	43	65	49	74	67	101	69	103	73	111
<i>Mediterranean</i>														
France, Marseille.....	43	64	44	66	46	69	52	78	69	103	70	106	75	113
Italy, Naples.....	44	67	46	69	48	72	54	81	71	106	72	108	77	115
Algeria, Algiers.....	41	61	42	63	44	67	50	76	67	101	69	103	73	111
Strait of Gibraltar.....	38	57	39	59	42	63	48	72	65	97	66	99	71	106
<i>Caribbean and South Atlantic</i>														
Bermuda, Hamilton.....							30	45	48	72	50	75	55	83
Puerto Rico, San Juan.....	29	44	28	42	27	40	29	44	44	66	46	69	50	76
Trinidad, Port of Spain.....	32	48	31	47	30	45	33	49	45	68	47	70	52	78
Brazil, Rio de Janeiro.....	49	73	49	74	49	73	51	78	64	96	66	100	71	107
Argentina, Buenos Aires.....	55	83	56	84	55	83	59	88	71	106	73	110	78	118
Panama, Panama Canal.....	33	48	32	48	30	45	28	42	38	56	39	59	44	67

See footnotes at end of table.

Ports	Ports of embarkation ¹													
	Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
	Type of shipping													
	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
<i>Middle East</i>														
Egypt, Port Said.....	50	75	50	76	54	80	60	89	76	114	78	117	83	124
Arabia, Aden.....	51	78	60	89	62	93	68	102	85	127	86	130	92	137
Turkey, Istanbul.....	49	74	50	76	53	80	59	89	76	113	77	116	82	124
Iraq, Basra.....	71	106	72	108	73	110	80	120	97	145	99	147	104	155
<i>North Pacific</i>														
Alaska, Dutch Harbor.....	65	97	65	97	62	93	61	91	35	52	33	49	30	45
<i>Middle Pacific</i>														
Hawaiian Islands, Honolulu.....	62	93	61	91	59	88	57	86	33	48	33	49	35	52
Marshall Islands, Kwajalein.....	76	114	75	113	72	109	71	107	46	69	47	70	48	71
Marianas, Guam.....	82	124	81	122	78	118	77	116	54	81	50	76	50	75
Japan, Yokohama.....	80	121	79	118	78	117	76	113	49	74	48	71	46	69
<i>Southwest Pacific</i>														
New Guinea, Finschhafen.....	82	124	81	122	78	118	77	116	57	86	56	84	57	85
Philippines, Manila.....	91	136	89	133	87	131	86	129	60	90	59	88	57	86
Australia:														
Brisbane.....	80	121	78	118	77	115	76	113	59	88	58	87	60	89
Melbourne.....	82	123	80	121	78	117	77	116	62	94	62	94	65	97
Malaya, Singapore.....	80	121	82	123	83	126	90	134	68	102	66	99	63	95
<i>China-India-Burma</i>														
China:														
Shanghai.....	86	129	85	127	82	124	81	122	55	82	53	80	50	76
Hong Kong.....	90	135	88	132	86	129	85	127	59	89	57	85	55	82
India:														
Bombay.....	69	103	70	106	72	109	78	117	94	142	97	145	102	153
Calcutta.....	79	118	80	120	82	124	88	132	83	124	80	121	78	117
Calcutta.....	79	118	80	120	82	124	88	132	105	157	108	160	112	167
Calcutta.....	79	118	80	120	82	124	88	132	78	117	76	113	73	110
Burma, Rangoon.....	79	118	80	120	82	124	88	132	165	157	108	160	112	167
Calcutta.....	79	118	80	120	82	124	88	132	75	113	72	109	70	106
East Russia, Vladivostok.....	78	117	77	115	74	112	73	110	50	76	48	72	47	70

¹ All turnaround times are based on the routes indicated in the table in paragraph 7.54 and on data given in c above. The turnaround times between ports, with the exception of inter-U.S. port times, include a 10 percent safety factor for forming convoy zigzagging, etc.

Section X. MISCELLANEOUS TRANSPORT

7.56. General

There are other means of transportation which are relatively less important than pipeline, water, rail, highway, and air transporta-

tion in the overall picture of transportation, but all have peculiar characteristics which are adaptable to special situations, as indicated in paragraphs 7.57 through 7.60. For this reason, planners should not underestimate their value.

7.57. Characteristics of Cableways and Tramways

Type	Employment	Maximum length (ft)	Carriers			Construction effort	Transportation required
			Description	Capacity each (lb)	Speed		
Engineer medium cableway.	Transports materiel and personnel over a single ravine, gorge, or gully.	1,200	1 weighted fall block.	3,000	550 feet per minute.	2 engineer platoons—1 on each bank—can erect a cableway across a 1,000-foot gap in 4 hours.	Four 2½-ton cargo trucks or fourteen ¾-ton cargo trucks.
Engineer light aerial tramway M2.	Transports materiel and personnel over slopes up to 35° from the horizontal and spans streams and ravines that lie across its route	3,000	2 cargo platforms, 3' 6" × 1' 11¾"; and 2 litter platforms, 6' 4" × 1' 11¾".	350	400 feet per minute.	An engineer company can construct a 3,000-foot tramway in 24 hours.	Four 2½-ton cargo trucks, twelve ¾-ton cargo trucks, thirty-five ¼-ton trailers, thirty-five ¼-ton trucks, or 100 pack mules.
Engineer light pioneer aerial tramway and cableway, M1.	Transports materiel and personnel over terrain inaccessible or difficult for other means of transportation. Can be used as a cableway to cross a single ravine, gorge, or gully; as a tramway to traverse slopes up to 35° from the horizontal; or as a toboggan-hauling unit for operation either on snow or smooth ground.	Tramway—2,000; cableway—1,500.	6 platforms, 3' 6" × 2' (or 3 platforms, 7' × 2'); and 2 plywood toboggan sleds, 8' × 2' 4".	Tramway—350; cableway and toboggan 2,000.	Tramway—310 feet per minute; cableway and toboggan—580 feet per minute.	2 engineer platoons can erect a 2,000-foot tramway in 8 to 12 hours. One engineer platoon can erect a 1,500-foot cableway in 5 hours.	One 2½-ton cargo truck, four ¾-ton cargo trucks, nine ¼-ton trailers, nine 1¼-ton trucks and one ¼-ton trailer, or 35 pack mules.
Transportation heavy aerial tramway.	Transports supplies and equipment from shipside in the stream to an inland terminal point; may also be used over terrain inaccessible to other means of transportation and to span ravines, gorges, and gullies not exceeding 700 feet in width.	Unlimited.	6 cars (2 in reserve to provide necessary maintenance (factor), each powered by a 180-HP gasoline engine and equipped with hoist and cargo platform.	20,000	10 miles per hour loaded.	For planning purposes, an engineer port construction company normally requires approximately ten 20-hour days (6,000 man-hours) to erect a basic 1-mile tramway system. This figure will be increased considerably, however, under adverse conditions of weather and terrain, the latter being the most critical factor.	One transportation medium truck company (S&P) and four 40-foot lowbed trailers. ¹

¹ Entire system can be transported by water on spud-barges organic to the tramway company.

7.58. Pack Animals

a. *Employment.* Pack mules may be employed to transport light cargo over terrain which is impassable for motor transport.

b. *Characteristics and Capabilities.*

- (1) *Height*—59 to 62 inches.
- (2) *Weight*—1,000 to 1,200 pounds.
- (3) *Rate of march*—4 to 5 miles in the hour.
- (4) *Cargo load*—200 to 250 pounds.
- (5) *Movement of casualties*—one litter or two sitting casualties.
- (6) *Forage*—10 pounds of oats and 14 pounds of hay per day. May be reduced for short periods up to 10 days without impairing capacity.
- (7) *Water*—10 gallons per day.
- (8) *Average daily distance.*
 - (a) Mountainous terrain—12 miles.
 - (b) Rolling or flat terrain—20 miles.
- (9) *Gradability.*
 - (a) Rate of ascent—1,650 vertical feet per hour.
 - (b) Rate of descent—1,000 vertical feet per hour.
- (10) *Noneffective rate*—32 per 1,000 mules.

c. *Transportability.*

	1	2
1	Vehicle	Capacity (horses or mules)
2	Truck, $\frac{3}{4}$ -ton, cargo, 4 x 4.....	2
3	Truck, $2\frac{1}{2}$ -ton, cargo, 6 x 6.....	4
4	Semitrailer, 6-ton, combination animal and cargo.....	8
5	Railroad stock car, 40-foot.....	25 (approx.)
6	Railroad stock car, 36-foot.....	20 to 22 (approx.)
7	Airplane, transport ¹	4 to 6

¹ May be transported at altitudes up to 18,000 feet with no ill effects.

d. *Horse-Drawn Carts.* Capable of traveling 20 miles in the day and sustaining a payload of 1,000 pounds.

7.59. Sled Trains

a. *General.* The mission of a sled train is to furnish oversnow and overice movement of supplies, equipment, and personnel. Sled trains

will be employed when more efficient means of transportation are not feasible.

b. *Planning Factors.*

(1) *Capability of tractor prime movers.*

For planning purposes, the ideal load for tractors, based on their drawbar pull and allowing sufficient reserve power, is as follows:

	1	2	3
1	Class	Net weight (lb)	Load
2	Tractor, crawler-type, diesel-engine driven, 12,001–17,000-pound drawbar pull.	10,709	2 loaded 10-ton sleds plus 1 wanigan.
3	Tractor, crawler-type, diesel-engine driven, 17,001–24,000-pound drawbar pull.	17,667	3 loaded 10-ton sleds plus 1 wanigan.
4	Tractor, crawler-type, diesel-engine driven, 24,001–32,000-pound drawbar pull.	25,470	4 loaded 10-ton sleds plus 1 wanigan.
5	Tractor, crawler-type, diesel-engine driven, 32,001–40,000-pound drawbar pull.	36,553	6 loaded 10-ton sleds plus 1 wanigan.

Note. Not used when traveling over unprepared trails or cross country.

(2) *Payload capacity.* Providing that well-marked trails are used, weather delays will be encountered, and malfunctioning equipment will be dropped for later recovery, the cargo-hauling capabilities of 5 tractor sled trains (D7 LGP) on 100- and 200-mile destination trips are as follows:

	1	2	3
1		200 miles round trip	400 miles round trip
2	Fuel per tractor—2.1 GPM × miles (round trip).	420 gal	840 gal
3	Gal per tractor × 5 tractors..	2,100 gal	4,200 gal
4	Safety margin 15 percent....	315 gal	630 gal
5	Total gal.....	2,415 gal	4,830 gal
6	Total gal × 7 lb per gal (bulk diesel).	16,905 lb	33,810 lb

	1	2	3
1		200 miles round trip	400 miles round trip
7	Lube, alcohol, antifreeze—20 lb per tractor per 100 miles of operation.	200 lb	400 lb
8	Planning factor travel time at 60 miles per day.	4 days	7 days
9	Rations—19 crewmen × 10 lb per day × number of days (include 1 day emergency).	950 lb	1,510 lb
10	Fuel for 2 stoves (cook and heat), oil or coal (100 lb each per day).	800 lb	1,400 lb
11	Fuel for electric generator (5 gal per tractor per day).	140 lb	245 lb
12	Fuel for personnel heaters (3 gal per tractor per day).	420 lb	735 lb
13	Survival equipment.....	400 lb	400 lb
14	Tools and repair parts.....	2,000 lb	2,500 lb
15	Total domestic load...	21,815 lb or 10.9 short tons	41,010 lb or 20.5 short tons
16	Gross capacity 14 sleds at 7.5 short tons.	98 short tons	98 short tons
17	Payload capacity.....	87.1 short tons	77.5 short tons

c. *Transportation Cargo Carrier Company (Tracked) (TOE 55-27)*. See FM 101-10, part II.

7.60 Human Bearers

a. *General*. Human bearers consist of indigenous or other personnel used for the transportation of personnel and/or supplies. Their use is generally limited to those situations where other means are impracticable or not available.

b. *Planning Data*. For planning purposes, the following may be assumed:

- (1) *Cargo loads*.
 - (a) Male bearer—80 pounds average load.
 - (b) Female bearer—30 to 35 pounds average load.
- (2) *Personnel loads*—8 to 12 bearers per litter team (for continuous operation).
- (3) *Rate of march*—12 miles in the day under average conditions.
- (4) Overloading and speedup of operations cause desertions and increase the sick rate.
- (5) *Noneffective rate*—approximately 30 percent.
- (6) Close supervision required to prevent pilferage.

CHAPTER 8

LOGISTICS—SERVICE

Section I. GENERAL

8.1. Coverage

This section contains information of and measurement factors involved in the services other than supply.

8.2. Cross References

a. Troop requirements for all services are found in paragraphs 4.1 through 4.7 and in FM 101-10, part II.

b. Tactical signal communication is covered in paragraphs 4.20 through 4.27.

c. Field engineering is covered in paragraphs 4.28 through 4.35.

d. Characteristics of materiel of all services are covered in chapter 5.

8.3. Base Development

a. *General.* For general aspects of base development planning, including responsibilities for, planning considerations, the planning directive, elements of base development plans, and a sample format for a base development plan, see FM 100-10.

b. *Phases of Base Development.*

- (1) *Assault and consolidation.* This is the period for the assault and consolidation by the combat forces in the objective area. Some elements of the base command are attached to tactical units and arrive early in the operation to assist in initiating base development.
- (2) *Exploitation.* This period covers the time between the establishment of the combat forces in the objective area and the time that tactical operations have progressed to such a degree that the base area is relatively secure from ground attack.

- (3) *Development.* This is the principal period for base development. It extends from the time the base area is relatively secure from ground attack until the cessation of tactical operations or until rollup begins.

c. *Logistical Requirements for Base Development.* Logistical requirements for the three phases of base development vary widely. During the assault and consolidation phase, logistical requirements are characteristic of those peculiar to amphibious or airborne operations. (See FM 31-12, *Army Forces in Amphibious Operations (The Army Landing Force)*, and FM 57-100, *The Airborne Division*, respectively.) During the exploitation phase, requirements become progressively more stable, centralized, and predictable. In the development phase, installations are completed, streamlined, and balanced to produce an efficient flexible operating base. (For detailed estimates of materials and efforts required, see TM's 5-301, 5-302, and 5-303.)

d. *Logistical Data for Base Development.* Data applicable to initial base development planning in its various phases are found throughout this manual. Data pertaining to major base development tasks are found in the following locations:

- (1) Storage—paragraphs 5.60 through 5.70.
- (2) Hospital bed requirements—paragraphs 6.6 through 6.9.
- (3) Transportation—paragraphs 7.1 through 7.60.
- (4) Construction—paragraphs 8.4 through 8.13.
- (5) Communications—paragraphs 4.20 through 4.27.

Section II. CONSTRUCTION

8.4. Engineer Construction Troops

a. Battalion Month. One battalion month is the construction effort of an average experienced and properly equipped engineer construction battalion during 1 month of time. For general estimates, the battalion month represents 100,000 man-hours of construction effort. (See pars. 8.12a(2) and b.)

b. Force Estimates. The force estimates outlined herein should be used only as a general planning guide and must be modified for known or expected conditions of particular operations.

c. Unit Equivalents. It is not practicable to state an average factor for construction effort of the various other engineer units, based on the battalion-month yardstick, as defined in *a* above, which will be applicable to all types of construction projects. The quantity and type of equipment assigned to the unit and its training are important factors in determining its effectiveness on a particular type of construction work. *For example*, an engineer combat battalion would be more effective than an engineer construction battalion in the repair of roads in a combat zone (average factor 1.3), but an engineer combat battalion would be much less effective than an engineer construction battalion in the construction of a new road in the communications zone, requiring considerable earthmoving (average factor 0.6). The factors listed in the table below are based on the assumption that, in general, the average construction project in a combat zone requires much less heavy engineer equipment than the average construction project in a communications zone. The factors apply only to properly equipped engineer units of average experience. They should be used only in broad planning and do not apply to any one particular construction project. The many factors involved make it advisable that an experienced engineer officer, *familiar with the technical details of a particular project*, determine the type of engineer unit to be assigned to its construction, whenever practicable.

1	Unit	2	3
		Average construction effort factor	
		Combat zone	Communications zone
2	Engr const bn.....	1.0	1.0
3	Engr cmbt bn.....	1.3	0.6
4	Engr hv const bn.....	0.9	1.2
5	Engr cmbt bn plus LE co.....	1.4	0.9
6	Engr const bn plus hv eqp co..	1.2	1.4

8.5. Roads

a. Road Nets.

- (1) Construction and maintenance of roads in a theater of operations is held to the minimum required by the situation and is based on maximum use of the existing road net. The capacity of roads of various types, in short tons forward per day, is given in paragraph 7.14.
- (2) Normally the minimum two-lane road nets to be provided and maintained are as follows:
 - (a) In the combat zone—
 1. One earth road per division forward of division rear boundary.
 2. Two improved (gravel, crushed rock, etc.) roads per corps forward of field army rear boundary.
 3. Lateral improved roads at 10-mile intervals in rear of division rear boundary.
 4. Access roads as required at depots, supply points, and other installations in corps rear and field army service areas.
 - (b) In the communications zone—
 1. Two bituminous surface-treated roads to each field army service area. Connecting roads as required to ports and beaches.
 2. Access roads as required at depots and other installations in the communications zone.

b. New Construction of Roads.

(1) *Construction policy.* New road construction is undertaken only when absolutely necessary, and normally it includes only such items as detours to bypass demolitions and access roads. The factors listed in the tables in (3) through (8) below are given primarily for estimating rehabilitation as a percentage of the requirements for new construction.

(2) *Bridge and culvert requirements.* For planning purposes, it is assumed that 1 mile of new road requires 40 lineal feet of bridging and seven culverts.

(3) *Material requirements for 1 mile of new road (including bridges, culverts, asphalt, and cement for concrete pavement).* This table does not include gravel or crushed rock requirements for round surfacing, which are given in table in (4) below.

(4) *Gravel or crushed rock requirements for 1 mile of new road.*

1	1	2	3	4	5
	Type of road	Surface 12 feet wide		Surface 24 feet wide	
		Cubic yards	Short tons	Cubic yards	Short tons
2	Surface 4" thick ¹ ----	782	1,173	1,564	2,346
3	Surface 5" thick ¹ ----	978	1,446	1,836	2,892
4	Surface 6" thick ¹ ----	1,174	1,761	2,348	3,522
5	3" asphalt surface----	587	881	1,174	1,762
6	4" concrete surface----	782	1,174	1,564	2,348
7	6" concrete surface----	1,173	1,761	2,346	3,522

¹ Based on loose thickness. For compacted thickness, add 25 percent.

(5) *Corrugated metal culvert pipe requirements per mile of road.* (Based on average length of 36 feet per culvert for one-lane roads, 56 feet per culvert for two-lane roads, and seven culverts per mile.)

Note. Bridging as in (6) below, except that bridging for earth roads, is estimated at 75 per cent timber and 25 percent steel stringers on wood substructures.

1	1	2	3	4	5
	Type of road	Single-lane 12 feet wide		Double-lane 24 feet wide	
		STON	MTON	STON	MTON
2	Earth-----	39	42	65	71
3	Gravel or crushed rock, 6"-----	47	58	106	120
4	Asphalt palliative----	53	61	117	136
5	1" asphalt surface----	61	87	134	172
6	2" asphalt surface----	75	110	155	206
7	3" asphalt surface----	82	121	168	241
8	Concrete, 6" surface--	315	205	657	340

	1	2	3	4	5	6	7	8	9
		Size (inches) diameter)	Percentage	Surface 12 feet wide			Surface 24 feet wide		
				Linear feet	Weight (pounds)	Cubic feet	Linear feet	Weight (pounds)	Cubic feet
2	Average quantities for culvert.....	18	15	4.5	72	1.22	9.0	144	2.44
3	.....	24	25	7.5	157	2.78	15.0	314	5.56
4	.....	36	30	9.0	333	7.38	18.0	666	14.76
5	.....	42	7	2.1	134	2.31	4.2	268	4.62
6	.....	48	15	4.5	324	6.35	9.0	648	12.70
7	.....	60	8	2.4	264	6.00	4.8	528	12.00
8	Total.....		100	30.0	1,284	26.04	60.0	2,568	52.08
9	Quantities per mile.....			210.0	8,988	182.28	392.0	16,891	342.16
10	.....	Short tons.....			4.22			8.17	
11	.....	Measurement tons.....			4.25			8.78	
12	.....	Man-hours.....			1,260.00			1,960.00	

(6) *Fixed-bridge requirements per mile of road.* (Based on 40 lineal feet of bridging per mile of route and on average percentages of the various types of standard military bridging spans.¹)

¹ These data are based on timber and woodpile sub-structures. If the planning includes steel trestle piers for 60- to 130-foot spans, add 0.500 short ton, 0.375 measurement ton, and 7½ man-hours per lineal foot of one lane bridge. Double these quantities for two-lane bridge.

	1	2	3	4	5	6	7	8	9
	Type of span	Percent- age	Lineal feet	One-lane			Two-lane		
				Short tons	Measure- ment tons	Man- hours	Short tons	Measure- ment tons	Man- hours
2	Timber, 14-20 ft ¹	20	8.0	6.13	7.21	73	9.67	11.23	120
3	30-ft span, 6-27 in., WF beams ²	21	8.4	(3)	(3)	(3)	11.54	12.52	236
4	60-ft span, 6-36 in., WF beams ²	24	9.6	(3)	(3)	(3)	11.16	12.80	380
5	80-ft span, 9-36 in., WF beams ²	12	4.8	(3)	(3)	(3)	6.76	8.12	214
6	6-48-in. steel girders, 90-120-ft span.....	11	4.4	(3)	(3)	(3)	7.80	7.98	112
7	Bailey, through truss, DD, 130 ft.....	12	4.8	7.88	8.90	102	15.04	17.05	196
8	Total.....	100	40.0	NA	NA	NA	61.97	69.68	1,258

¹ Timber bridge data are based on typical timber bridging with 15-foot wood stringers. See TM 5-286

² Semipermanent steel highway bridging is described in TM's 5-285 and 5-302.

³ One-lane bridging is not applicable.

(7) Highway bridge construction, fixed bridging (types, capacities, and references).

1	1	2	3	4	5
	Type	Maximum span	Capacities		References
			Double-lane design	Single-lane or with caution ¹	
2	27-in., 94-lb WF beam.....	52-ft.....	Class 60.....	Class 100.....	TM's 5-286 and 5-302.
3	36-in., 150-lb WF beam.....	90-ft.....	Class 60.....	Class 100.....	TM's 5-286 and 5-302.
4	48-in., 275-lb girder.....	128 ft.....	Class 60.....	Class 100.....	TM's 5-286 and 5-302.
5	Bailey.....	30- to 180-ft.....	Class 10-80 ²	Class 55-100 ²	TM's 5-277 and 5-286.

¹ Controlled single-lane traffic over double-lane bridges or with caution reference Bailey bridge spans.

² Varies with type and span length. See TM 5-277.

(8) Construction effort. Net effective man-hours of engineer construction troops required for grading and surfacing 1 mile of new road to the following

standards: single-lane road (12-foot traffic lanes plus 4-foot shoulders); double-lane road (24-foot traffic lane plus 4-foot shoulders).^{1 2}

1	1	2	3	4	5	6	7
	Terrain	One-lane			Double-lane		
		Grading only	Grading and 6-in. gravel	Grading, 6-in. gravel, and 3-in. asphalt.	Grading only	Grading and 6-in. gravel	Grading, 6-in. gravel, and 3-in. asphalt
2	Flat prairie.....	2,500	3,300	12,500	3,700	5,200	20,400
3	Rolling.....	3,400	4,200	13,500	4,300	6,000	21,000
4	Hilly, forested.....	4,700	5,600	14,750	6,000	7,600	23,000
5	Mountain, forested, no rock.....	8,400	9,300	18,500	23,000	29,000	45,500
6	Mountain, some rock.....	14,000	19,500	28,500	39,000	49,000	64,500
7	Mountain, heavy rock.....	26,500	32,000	41,500	74,000	84,000	101,000

¹ Based on pit-bank run gravel, except lines 6 and 7, which are based on crushed rock for material.

² The tabulated man-hours do not include effort for bridging and culverts.

c. Road Rehabilitation. Materials and effort required to rehabilitate roads after action, in percentages of the materials and effort required for new construction, are as follows:

1	1	2
	Rehabilitation of—	Equivalent percentages of new construction (percentage)
2	Roads.....	10 to 20
3	Culverts.....	15
4	Bridges.....	50 to 90

d. Road Maintenance. After rehabilitation, and not allowing for further damage in action, suitably trained and equipped engineer troops

maintain roads on the basis of 15 man-hours net effective effort per mile of road per day.

e. Policy for Road and Bridge Construction.

(1) Responsibility. Between combat and communications zones, bridging is normally on an area basis. Theater army logistical command forces take over bridging operations in rear of the field army area as rapidly as possible. Rearward elements assume bridge and road maintenance in forward areas as soon as the situation permits. Rearward engineer units are charged with replacing tactical and other portable types of bridging with nonportable types as quickly as

possible, strengthening bridging to carry successively heavier loads, and removing such tactical bridging as the situation justifies.

- (2) *General bridge policy.* Tactical bridging is normally placed by corps engineers. Organizational equipment will be replaced as quickly as possible by rearward engineers. Stocks of Bailey, WF beam, girder, I-beam, 90-foot pony truss bridging, and timber trestle bridge with steel beams are available in depots for use in the communications zone and also in the combat zone when time and the tactical situation permit. Bailey bridging will be utilized by forward units when practicable. Replaced and surplus bridging is returned to depots.

8.6. Railway Construction

a. New Construction.

- (1) The railroad division used in planning includes 100 route miles of main line, single or double track, together with its terminal operating and maintenance facilities, fueling and watering facilities as required, and the necessary signaling equipment or interlocking facilities for safe operation. Passing sidings on single-track lines, stations, and crossovers at double-track lines at stations are at intervals as required by the traffic. Normally, at least one spur or siding is provided at each station.
- (2) Materials and man-hours (net effective) required for new construction of 1 mile of standard gage (4 ft 8½ in.) single-track railroad are as follows:

1	1			
	Item	2 Short tons	3 Measure- ment tons	4 Man- hours
2	Grading.....			14,000
3	Ballast delivered.....			22,500
4	Track laying and surfacing.....			2,570
5	Bridging—70 linear feet per mile.....	101	111	2,200
6	Culverts—7 per mile—average 40-foot length.....	8	7	1,400
7	Ties—2,900.....	218	300	
8	Rail—90 pounds.....	160	45	
9	Fastening (based on 39-ft rail).....	33	10	
10	Total.....	520	473	12,670

¹ Includes clearing based on average wooded terrain.

² Bank-run material, average haul—5 miles.

b. Rehabilitation. The following table reflects the rehabilitation requirements which can be anticipated for a 100-mile standard gage single-

track division extending inland from a port, using average percentages of demolition over the entire division.

	1	2	3	4	5	6	7
	Items	Quantity per 100 miles	Demolition percentage	Rehabilitation (quantity)	Material ¹		Man-hours ¹ (thousands)
					Short tons	Measurement tons	
2	Main line.....	100 mi	13	13 mi	3,820	2,514	68
3	Port trackage ²	3 mi	100	3 mi	1,440	1,098	22
4	Passing sidings ²	4.5 mi	80	3.6 mi	1,730	1,320	17
5	Station sidings ²	3 mi	80	2.4 mi	1,150	880	12
6	Railway terminal ^{2 3}	1 ea	75	0.75 ea	7,100	6,800	160
7	Regulating station ^{2 4}	1 ea		1 ea	6,530	7,340	230
8	Water stations.....	3 ea	100	3 ea	135	210	9
9	Fuel station.....	1 ea	100	1 ea	21	18	1
10	Bridging.....	7,000 linear ft	70	4,900 linear ft	8,950	7,770	154
11	Culverts.....	28,000 linear ft	15	4,200 linear ft	120	105	21
12	Grading.....						35
13	Ballast.....						44
14	Total.....				30,996	28,055	773

¹ Tunnels require special consideration. To repair (by timbering) a 50-foot demolition at each end of a single-track tunnel (100' total per tunnel), allow 70 tons, 87 measurement tons, and 3,000 man-hours.

² Estimate includes ties, rails, fastenings, turnouts, and track laying and surfacing. It assumes ballast is available at work sites.

³ Includes replacement of buildings 100 percent, ties 30 percent, rail and turnouts 85 percent.

⁴ Provides minimum requirements for replacement buildings, rail and turnouts 100 percent, ties 85 percent, man-hours 100 percent of new construction.

8.7. Water Terminal Construction

a. Approximate Planning Factors. The following planning factors give the materials and man-hours required for water terminal facilities adequate for the handling of 720 short tons of discharged dry cargo per day of 20-hour operation. This is a convenient unit because it is the wharf discharge rate of one ship, Victory-type, as given in paragraph 7.6d. The

facilities include ship or lighterage wharf space, access road from wharf to road net, and minimum covered and open storage. Of the four factors given, cases I and II are based on new wharf construction, the others on rehabilitation.

- (1) *Case I.* New construction of 500 linear feet of deep-draft marginal wharf (par. 7.6) and port facilities for 720 short tons per day.¹

¹ If site conditions favor finger-type piers 500 feet by 90 feet, 2 berths per pier, the above factors per berth continue to apply.

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	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Timber pile marginal wharf, 500' × 60'.....	1,680	2,498	21,340
3	0.7 mile of access road, asphalt-surfaced, 24' wide.....	70	87	14,000
4	2 miles of railroad, including sidings ¹	822	710	14,500
5	10,000 square feet covered storage ²	65	80	1,800
6	60,000 square feet open storage.....			50
7	Total.....	2,637	3,375	51,690

¹ Based on 90-pound rail and on normal requirements for service and yard tracks and for terminal car storage.

² Based on shell-type insulated warehouses with 4-inch concrete floors.

(2) *Case II.* New construction of 350 linear feet of marginal lighterage

wharf (par. 7.6) and port facilities for 720 short tons per day.

	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Timber pile marginal wharf, 350' × 35'.....	600	800	8,400
3	0.7 mile of access road, asphalt-surfaced, 24' wide.....	70	87	14,000
4	2 miles of railroad, including sidings ¹	822	710	14,500
5	10,000 square feet covered storage ¹	65	80	1,800
6	60,000 square feet open storage.....			50
7	Total.....	1,557	1,677	38,750

¹ Notes 1 and 2, case I, apply also to case II.

(3) *Case III.* Rehabilitation of 500 linear feet of deep-draft wharf, clearance of debris, and new construction of other

terminal facilities for 720 short tons per day.

	1	2	3	4
1	Item	Short tons	Measurement tons	Man-hours
2	Repair of 500 linear feet of deep-water wharf ¹	1,375	2,910	25,000
3	0.7 mile of access road, asphalt-surfaced, 24' wide.....	70	87	14,000
4	2 miles of railroad, including sidings ²	822	710	14,500
5	10,000 square feet covered storage ²	65	80	1,800
6	60,000 square feet open storage.....			50
7	Clearing debris ³			2,500
8	Total.....	2,332	3,787	57,850

¹ Based on repair of cratered wharf faces by timber and V-trestle construction to a width of 60 feet.

² Notes 1 and 2, case I, apply also to case III.

³ Based on 10 percent of the man-hours in line 2.

(4) *Case IV. Rehabilitation of 350 linear feet of lighterage wharf, clearance of debris, and new construction of other*

port facilities for 720 short tons per day.

	1	2	3	4
	Item	Short tons	Measure-ment tons	Man-hours
2	Repair of 350 linear feet of lighterage wharf ¹	580	920	10,500
3	0.7 mile of access road, asphalt-surfaced, 24' wide.....	70	87	14,000
4	2 miles of railroad, including sidings ²	822	710	14,500
5	10,000 square feet covered storage ²	65	80	1,800
6	60,000 square feet open storage.....			50
7	Clearing debris ²			1,100
8	Total.....	1,537	1,797	41,950

¹ Based on repair of cratered wharf faces by timber or steel sheet pile.
² Notes 1 and 2, case I; and note 3, case III, apply also to case IV.

b. Construction Rate for Pile-and-Timber Wharves. Normally, one engineer construction company constructs 500 linear feet of deep-draft marginal wharf, or equivalent, in about 6 days. These rates cannot be improved by using a force larger than a company on one wharf structure of these sizes because of the sequences necessary in pile driving, capping, bracing, and deck construction.

c. Demolition of Existing Facilities. Experience in the invasion of developed harbors indicates the average percentages of demolitions to be anticipated are as tabulated below. In addition, the removal of sunken wrecks or blockships may be required; normally, 2 or 3 in a small harbor, 10 or 20 in a large one. If the harbor entrance is narrow, it is usually found blocked.

	1	2
	Facilities	Average demolition
2	Permanent wharves or quays.....	30 percent very badly damaged; early repair impracticable. 30 percent heavily damaged; much debris; reasonably early repair possible. 40 percent lightly damaged; less debris; early repair practicable.
3	Port cranes.....	100 percent destroyed.
4	Port warehouses.....	50 percent to 100 percent destroyed.

d. Utilities Required at Ship Wharves.

- (1) *Fresh water.* With pressures normal in municipal water supply, one 4-inch pipeline with three 2½-inch outlets refills a Liberty ship's capacity of 115,000 gallons in 6 hours.
- (2) *Illumination.* Five-hundred-watt incandescent lamps, mounted 35 feet above the wharf deck and spaced at intervals of 120 feet, provide adequate illumination averaging 1 to 2 foot-candles.

e. Construction Factors for Specific Types of Deep-Draft Wharves and Approaches. The following information is based on details in TM's 5-301 and 5-303, using woodpiles and timber deck.

	1	2	3	4
1	Type of wharf	Short tons	Measurement tons	Man-hours
2	Finger pier, 500' × 90', with railway, 5' tide.....	2,468	3,685	29,040
3	Finger pier, 500' × 90', with railway, 25' tide.....	2,998	4,528	35,430
4	Marginal wharf, 500' × 60', with railway, 5' tide.....	1,680	2,498	21,340
5	Marginal wharf, 500' × 60', with railway, 25' tide.....	2,008	3,021	24,610
6	Wharf approaches, 30' wide (per 100 linear ft), no railway, 5' tide.....	86	123	3,230
7	Wharf approaches, 30' wide (per 100 linear ft), with railway, 25' tide.....	343	501	6,800

f. Construction Factors for Specific Types of Marginal Lighterage Wharves Per 100 Linear Feet.

	1	2	3	4
1	Type of construction	Short tons	Measurement tons	Man-hours
2	Timber pile, 35 feet wide, using 40-foot piles.....	171	228.0	2,400
3	Timber crib, supporting timber bents, 35 feet wide.....	143	193.0	2,800
4	Timber retaining wall (Wakefield pile) with earth or rubble fill.....	21	30.5	1,300
5	Steel sheet piling retaining wall with earth or rubble fill.....	27	25.0	1,100

g. Construction Factors for Floating Pontoon Wharves. Reference—*Pontoon Gear Manual*, 1 November 1952, Bureau of Yards and Docks, Department of the Navy. A floating wharf suitable for a Victory or Liberty ship berth is 6 pontoons wide by 72 pontoons long,

or about 43 by 433 feet. Four approaches, each 4 by 18 pontoons, about 28 by 108 feet, are usually adequate. Total area of wharf and approaches is 30,715 square feet. The construction factors are—

	1	2	3	4
1	Floating pontoon wharves	Short tons	Measurement tons	Man-hours
2	Per 1,000 square feet.....	42	127	343
3	Wharf and approaches as above, 30,715 square feet.....	1,290	3,900	10,535

h. Construction Requirements for Over-the-Beach Discharge of Cargo. Construction requirements for over-the-beach discharge of cargo include the construction of ramps, hardstands, egress roads, and beach stabilization. In general, local materials will be used. The

length of the ramps varies, depending on beach gradient and tidal range. The length of the ramp can be computed by the following formula:

$$\text{Beach gradient (ft)} \times [\text{tide range (ft)} + 4] = \text{Ramp length.}$$

The man-hours required for the construction

of 100 feet of various types of ramps, hardstands, and beach stabilization are as follows:

1	1	2
	Facility	Man-hours
2	Amphibious vehicle ramp, 56' wide x 100' long x 1.5' deep.	930
3	Landing craft ramp (LCU/LCM/LST), 29' wide x 100' long x 1.5' deep.	480
4	DUKW ramp, 15' wide x 100' long x 1.5' deep.	252
5	Hardstands and beach stabilization, 100' x 100' x 0.5' deep.	555
6	Maintenance: Ramps: 10 percent of initial effort per month. Hardstands and beach stabilization: 10 percent of initial effort per quarter.	

Note. See paragraph 8.5 for road construction factors.

8.8. Dredging

Since dredging is a slow operation, dredging harbors in a military operation should be avoided if possible. Likewise, because of the danger of damaging foundations, plans should not anticipate dredging in the close proximity of quay walls. Generally, demolition debris can be cleared in front of berthing sites by the use of dragline or clamshell cranes. If dredging of harbor areas is unavoidable, the following overall planning factors may be used as a guide. Dredging quantities vary considerably with the type of equipment used, the distance of haul to the spoil area, the method of haul, and the kind of material being excavated (sand, mud, gravel, soft rock or coral, hardrock, etc.).

	1	2	3	4	5
1	Type of dredge	Hydraulic suction ¹	Dipper	Clamshell or orange peel	Seagoing hopper ²
2	Size-----	12"-28" pipe-----	2-16 cu yd-----	1-9 cu yd-----	700-5,000 cu yd
3	Operating personnel----	Varies from 12-90-man crews, depending on size of dredge and number of shifts being worked.			
4	Operating characteristics and principal use.	Soft digging, river-channel dredging.	Clay, rock, or debris excavation.	Dredging in limited areas, caisson work, debris clearance.	Outer harbor work. Spoil area may be several miles away.
5	Maximum swells affecting operations.	3'-----	10'-----	10'-----	Designed for dredging in rough water.
6	Maximum dredging depth (ft).	15'-65'-----	20'-50'-----	10'-60'-----	36'-60'
7	Average daily capacity ³ (cu yds)-----	{ 5,400 (12")----- 28,000 (28")-----	2,000 (2 cu yd)----- 9,000 (16 cu yd)-----	500 (1 cu yd)----- 3,000 (9 cu yd)-----	6,500 (700 cu yd) 10,000 (5,000 cu yd)

¹ The average distance which this type of dredge pumps to a spoil area is 1,000-3,000 feet. On the Fort Peck Dam, the 28" dredge pumped 11,000-31,000 feet.

² The 700-cubic yard "Hoffman Type" dredge was designed for use in World War II. It is especially useful in cutting a channel across a shoal at a harbor entrance. In a military operation, it is probable that all other dredging would be accomplished with local equipment or on-site expedients.

³ Dredges normally require 1 day per week shutdown for maintenance. These figures do not include maintenance delays but do include time consumed in moving the dredge along the cut area.

8.9. General Construction

a. General. This paragraph presents planning factors for engineer materials and man-hours required for construction of facilities in the following categories:

- (1) Troop camps.
- (2) Administration.

- (3) Hospitals.
- (4) Depots.
- (5) Shops.
- (6) Refrigeration and iceplants.
- (7) Personnel service buildings, including laundries, drycleaning plants, bak-

eries, recreation centers, and base post offices.

(8) Prisoner of war camps.

b. Troop Camps.

(1) *Standards.* Troop camp requirements are estimated in six standards intended for varying degrees of permanence.

- (a) *Standard 1.* TOE tents; no engineer materials or effort involved.
- (b) *Standard 2.* Class IV tents pitched by using troops; no engineer materials or effort involved.
- (c) *Standard 3.* Buildings with floors for administration, bathhouses, infirmaries, storehouses, and kitchens. Class IV tents with floors for housing and with earth floors for all other purposes. Roads within the installations are stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, and kitchens. Electric distribution to buildings. Pit-type latrines.
- (d) *Standard 4.* Buildings with floors

for all purposes except housing, for which there are class IV tents with floors and wood frames. Roads within the installations are stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, kitchens, and camp exchange. Electric distribution to all facilities. Pit-type latrines.

- (e) *Standard 5.* Buildings with floors for all purposes; otherwise, the same as (d) above.
- (f) *Standard 6.* Latrines equipped with untreated sewage carried 1,000 feet beyond the confines of the camp; bituminous surfacing of roads within the installations; otherwise, the same as (e) above.
- (2) Structures will be prefabricated (metal-type) or standard (wood) frame for all climates. The following table states material and man-hour requirements, based on use of prefabricated buildings for the various standards of camps in the temperate climate, sizes from 250 to 3,000 men.

	1	2	3	4	5	6	7	8
	Standard	Size (number of men)	Electric (kw)	Water (M gal/day)	Site areas (acres)	Materials		Man-hours
						Short tons	Measurement tons	
1								
2	1	Organic tents—no engineer materials or effort required.						
3	2	Class IV quartermaster tents erected by using service. No engineer materials or effort required.						
4	3	250	2.2	3.7	10	87	146	5,115
5		500	7.9	7.5	20	149	269	9,705
6		1,000	12.6	15.0	35	278	501	16,795
7		1,500	15.4	22.5	50	389	704	24,565
8		3,000	27.0	45.0	75	605	1,181	43,320
9	4	250	5.4	6.3	10	127	224	8,505
10		500	17.3	12.7	20	249	481	16,500
11		1,000	31.6	25.5	35	470	901	30,055
12		1,500	39.4	38.2	50	630	1,200	41,400
13		3,000	78.0	76.5	75	1,215	2,346	82,515

	1	2	3	4	5	6	7	8
1	Standard	Size (number of men)	Electric (kw)	Water (M gal/day)	Site area (acres)	Materials		Man-hours
						Short tons	Measurement tons	
14	5	250	5.5	6.3	10	160	346	9,185
15		500	17.3	12.7	20	320	713	17,075
16		1,000	31.3	25.5	35	606	1,347	31,350
17		1,500	39.1	38.2	50	840	1,882	42,075
18		3,000	77.5	76.5	75	1,691	4,125	86,305
19	6	250	5.5	10.6	10	168	356	9,525
20		500	17.4	21.2	20	358	758	18,205
21		1,000	31.4	42.5	35	676	1,430	31,620
22		1,500	39.0	63.7	50	947	1,981	43,915
23		3,000	78.4	127.5	75	1,934	4,402	90,145

c. Administration Facilities.

- (1) *Standards.* Estimates are based on three standards: standard 3, standard 4, and standard 6. Standards specifications are the same as for troop camps.
- (2) *Structures.* Structures will be pri-

marily prefabricated. Material and man-hour requirements for administrative offices in temperate climate for 10,000, 25,000, and 50,000 square feet are listed in the following table:

	1	2	3	4	5	6	7
1	Standard	Size office space (M sq ft)	Electric (kw)	Water (GPD)	Materials		Man-hours
					Short tons	Measurement tons	
2	3	10	11.3	250	83	197	4,195
3		25	27.4	625	193	478	9,405
4		50	52.2	1,250	371	935	17,355
5	4	10	11.3	250	102	238	4,890
6		25	27.4	625	210	515	10,010
7		50	52.2	1,250	401	998	18,335
8	6	10	11.3	2,125	115	259	6,170
9		25	27.4	5,300	242	558	12,210
10		50	52.2	10,625	454	1,069	21,905

d. Hospitals.

- (1) *Standards.* Estimates are based on three standards similar in permanence to troop housing of standards 2, 4, and 6, respectively, as follows:
 - (a) *Standard 2.* All facilities in organic and class IV tents, hospital tents floored and framed, personnel tents pitched by using troops with no

engineer materials or assistance. Water piped from central storage tank to necessary facilities; roads unimproved; pit latrines.

- (b) *Standard 4.* Buildings for all facilities except hospital wards and personnel housing, for which concrete tent floors and wood frames are provided. Estimates do not provide

for iceplants, laundries, or refrigerated warehouses. Estimates include stabilized roads, water and electric distribution, plumbing, and water-borne sewage, but do not include sewage disposal plants.

(c) *Standard 6. Buildings and utilities*

complete for all facilities as described in TM 5-302. Bituminous-surfaced roads are included.

(2) *Material and man-hour requirements* for 25- to 1,000-bed hospitals of the above standards are as shown in the following table:

	1	2	3	4	5	6	7	8
1	Standard	Size (beds)	Electric (kw)	Water (M gal/day)	Site areas (acres)	Materials		Man-hours
						Short tons	Measurement tons	
	2	2	25	20	1.2	5	25	30	2,700
3	50		30	2.5	5	30	35	3,300
4	100		40	5.0	10	45	55	4,700
5	200		60	10.0	15	70	85	5,800
6	300		90	15.0	20	110	130	7,000
7	500		130	25.0	30	170	200	10,300
8	750		200	37.5	40	250	280	12,500
9	1,000		250	50.0	50	320	360	15,000
10	4	25	69	2.1	5	317	676	23,870
11		50	77	4.3	5	349	749	25,910
12		100	135	8.5	10	591	1,196	45,900
13		200	195	17.0	15	808	1,763	60,700
14		300	286	25.5	20	1,128	2,433	79,835
15		500	411	42.5	30	1,552	3,414	108,355
16		750	540	63.7	40	2,057	4,642	138,520
17		1,000	660	85.0	50	2,426	5,460	165,840
18	6	25	67	2.1	5	400	839	28,270
19		50	77	4.3	5	432	913	30,300
20		100	144	8.5	10	817	1,650	54,465
21		200	208	17.0	15	1,125	2,371	70,980
22		300	302	25.5	20	1,572	3,310	96,720
23		500	435	42.5	30	2,166	4,679	131,995
24		750	575	63.7	40	2,794	6,165	168,595
25		1,000	698	85.0	50	3,296	7,196	198,395

e. *Depots.*

(1) *Standards.* Estimates are based on three standards of construction for covered and open dry cargo storage and two standards for ammunition storage as follows:

(a) *Dry cargo storage.*

1. *Standard 2.* Class IV tents for all facilities requiring cover. Open storage cleared, graded, and drained. Roads graded, but not surfaced.

2. *Standard 3.* Sheds for covered

storage; class IV tents with floors for administrative space; without floors for other facilities requiring cover. Roads stabilized. Railroad sidings to open storage areas. Drainage and fencing provided when required.

3. *Standard 5.* Closed buildings for covered storage and administrative facilities. Bituminous-surfaced main access roads to covered and open storage areas; other interior roads stabilized.

Railroad sidings to storage areas. Drainage and fencing provided when required.

(b) *Ammunition storage.*

1. *Standard 2.* Class IV tents for 10 percent of the ammunition tonnage and for administrative facilities. Open storage areas cleared and graded. Access roads graded but not surfaced.

2. *Standard 3.* Sheds for 10 percent of the ammunition tonnage. Buildings for administrative facilities. Access roads and parts of open storage areas stabilized with local materials. Railroad sidings to storage areas.

- (2) *Material and man-hour requirements* for storage construction of the above standards are as follows:

(a) *Dry cargo storage—covered.*

1	1	2	3	4	5	6	7
	Standard	Size (M,sq ft)	Electric (kw)	Site areas (acres)	Materials		Man-hours
					Short tons	Measurement tons	
2	2	12	-----	1.0	0.3	0.3	200
3		25	-----	2.0	0.5	0.5	500
4		50	-----	4.0	1.0	1.0	1,000
5		100	-----	8.0	2.0	2.0	2,000
6	3	12	-----	2.5	38.0	120.0	1,640
7		25	-----	4.0	73.0	253.0	2,250
8		50	-----	6.5	137.0	495.0	4,400
9		100	-----	14.0	274.0	1,020.0	7,240
10	5	12	3.1	2.5	86.0	170.0	3,040
11		25	6.7	4.0	164.0	348.0	5,635
12		50	13.3	6.5	325.0	692.0	11,430
13		100	27.1	14.0	654.0	1,380.0	20,790

(b) *Dry cargo storage—open.*

1	1	2	3	4	5	6
	Standard	Size (M sq ft)	Site area (acres)	Materials		Man-hours
				Short tons	Measurement tons	
2	2	50	4	4	6	875
3		100	8	5	7	1,435
4		200	16	8	10	2,370
5	3	50	4	7	9	1,920
6		100	8	10	12	3,195
7		200	16	18	23	5,985
8	5	100	8	285	275	12,000
9		200	16	500	520	20,000
10		400	30	920	950	35,000

(c) *Ammunition storage—10 percent covered; 90 percent open.*

	1	2	3	4	5	6
1	Standard	Depot capacity (tons)	Site area (acres)	Materials		Man-hours
				Short tons	Measurement tons	
2	2	1,000	140	3	4	7,600
3		5,000	690	12	16	30,400
4		25,000	3,450	45	60	114,000
5	3	1,000	140	18	14	8,000
6		5,000	690	112	101	33,500
7		25,000	3,450	445	420	127,600

f. *Shops.*

(1) For covered shop requirements, see paragraph 8.18c.

(2) Material and man-hour requirements for various standard 5 shops are as follows:

(a) *Shops, general.*

	1	2	3	4	5	6	7
1	Capacity (sq ft)	Site area (acres)	Electric (kw)	Water (GPD)	Materials		Man-hours
					Short tons	Measurement tons	
2	5,000	1.8	18	50	80	90	3,100
3	50,000	5.0	175	500	1,090	1,090	27,700

(b) *Shops, special.*

	1	2	3	4
1	Type	Materials		Man-hours
		Short tons	Measure- ment tons	
	<i>Ordnance:</i>			
2	Collecting point.....	2,450	2,500	98,200
3	Park.....	1,700	1,750	75,900
	<i>Transportation:</i>			
4	Marine railroad repair shop, 500-ton.....	534	737	28,500
5	Marine railroad repair shop, 1,800-ton.....	1,428	2,028	49,400

g. Iceplants and Refrigerated Storage. Material and man-hour requirements for iceplants and refrigerated storage are as follows:

	1	2	3	4	5	6	7
1	Facility	Size	Water (GPD)	Electric (kw)	Materials		Man-hours
					Short tons	Measurement tons	
2	Iceplant.....	1-ton	250	0.1	18	30	870
3	Iceplant.....	3.6-ton	1,000	10.0	23	43	1,120
4	Iceplant.....	15-ton	4,000	46.3	131	243	2,950
5	Refrigerated warehouse.....	20' x 55'	100	15.6	41	92	1,600
6	Refrigerated warehouse.....	20' x 100'	100	23.4	76	175	2,400
7	Refrigerated warehouse.....	80' x 220'	100	141.0	552	1,312	13,640

h. Personnel Service Facilities. Material and man-hour requirements for buildings are as follows:

	1	2	3	4	5	6	7
1	Description	Size	Water (M GPD)	Electric (kw)	Materials		Man-hours
					Short tons	Measurement tons	
2	Drycleaning plant, w/boilerhouse...	1,000-man	4.4	5.7	12	29	1,280
3	Drycleaning plant, w/boilerhouse...	2,500-man	5.4	8.5	15	39	1,440
4	Drycleaning plant, w/boilerhouse...	5,000-man	8.4	23.6	31	64	2,160
5	Laundry, w/boilerhouse.....	2,500-man	67.5	35.4	102	220	5,830
6	Laundry, w/boilerhouse.....	5,000-man	141.0	69.0	141	312	8,020
7	Laundry, w/boilerhouse.....	10,000-man	249.0	117.4	236	517	11,690
8	Bakery ¹	Mobile			120	99	2,462
	Base post office:						
9	Type O, Std 3.....	11,200 sq ft		8.2	89	237	3,860
10	Type U, Std 3.....	80,000 sq ft	0.5	49.4	458	1,589	21,765
	Reception center:						
11	Std 2.....	5,000-man	10.0	21.4	55	82	4,940
12	Std 3.....	5,000-man	10.0	21.4	81	108	5,380
13	Std 4.....	5,000-man	10.0	28.3	234	695	10,955
14	Std 5.....	5,000-man	10.0	40.3	314	761	14,455
15	Std 4.....	10,000-man	20.0	52.5	464	1,099	19,050
16	Std 5.....	10,000-man	20.0	79.5	722	1,513	28,035

¹ Quartermaster mobile bakery requires building space to house its equipment when operating for an extended period of time in one location. These are shell buildings only.

i. Prisoner of War Camps.

(1) *Standards.* Estimates are based on three standards of permanence (2, 3, and 5) similar to troop housing and described as follows:

(a) *Standard 2.* Class IV tents with earth floors for prisoner of war housing. Bucket-type latrines. En-

gineer construction consists of security fences, lighting, guard towers, and water piping to the central inclosure.

(b) *Standard 3.* Bathhouse, latrine, and kitchen in buildings; all other accommodations in tentage. Two-inch concrete floors in buildings and

tentage. Electric distribution to buildings. Security fences, lighting, guard towers, and water supply same as standard 2. Bucket-type latrines.

(c) *Standard 5.* All accommodations in buildings. Four-inch concrete floors in storehouse; in all other buildings 2-inch. Other construction same as standard 3.

(2) *Material and man-hour requirements.*

	1	2	3	4	5	6	7	8
1	Standard	Size (number of pow)	Electric (kw)	Water (M gal/day)	Site area (acres)	Materials		Man-hours
						Short tons	Measurement tons	
2	2	500	-----	2.5	19	131	168	10,000
3		1,000	-----	5.0	30	193	255	15,000
4		4,000	-----	20.0	66	555	786	52,000
5	3	500	23	5.0	19	242	344	17,000
6		1,000	31	10.0	30	394	574	25,000
7		4,000	123	40.0	66	1,398	2,165	90,000
8	5	500	26	8.5	19	368	712	23,000
9		1,000	39	17.0	30	613	1,224	35,000
10		4,000	155	58.0	66	2,189	4,619	127,000

j. *Bivouacs, Camps, and Billets.*

- (1) *Bivouac areas.* The bivouac area of an infantry battle group size unit will vary from 23 acres to 1 square mile, as indicated by the situation. Considerations which affect the area required are the dispersion necessary to minimize the threat of enemy attack, the amount of cover and concealment available, and the characteristics of the terrain. The approximate minimum area required by a unit may be estimated as indicated below.

Note. Both methods should be used and the larger figure chosen.

- (a) *Vehicle dispersion.* When required dispersion of the vehicles with the unit should govern, use the following formula:

$$\frac{V \times D^2}{K} = \text{Area required, when}$$

V = Number of vehicles with the unit.

D = Desired dispersion between vehicles.

K = Conversion factor, as appropriate, to reduce the area to acres, hectares, square miles, or square kilometers.

Example: Assume that an infantry battle group has 200 vehicles and that a dispersion of 100 yards between vehicles is desired. Find the acres required.

$$\frac{200 \times (100)^2}{4,840 \text{ (sq yd per acre)}} = 413 \text{ acres.}$$

Personnel will be distributed throughout the area.

- (b) *Tent camps — capacity.* Medium general-purpose tent, normal assignment—12 to 16 men per tent; area required for an infantry battle group camp (open ground) approximately—23 acres; estimate of area required—50 square yards per man; 100 square yards per vehicle.

(2) *Data on tentage.*

	1	2	3	4	5	6	7
	Data on tentage						
1	Type	Dimensions	Surface area (sq ft)	Floor space (sq ft)	Vertical wall (height)	Weight in pounds per unit (packed)	Cubage per unit (packed)
2	Assembly.....	40' x 80'	4,965	2,860	8' 0"	1,000	34.35
3	Command post.....	20' 7" x 10'	1,079	172	5' 6"	257	9.90
4	General purpose, large.....	18' x 52'	2,158	936	5' 6"	420	34.50
5	General purpose, medium.....	16' x 33'	1,491	523	5' 6"	330	22.50
6	General purpose, small.....	(¹)	812	199	5' 0"	116	8.00
7	Kitchen, flyproof.....	12' x 18'	1,384	216	6' 0"	202	14.20
8	Maintenance shelter.....	18' x 26'	1,770	485	4' 8"	500	26.30
9	Paulin, large.....	20' x 40'	800	-----	-----	160	4.20
10	Paulin, small.....	12' x 17'	204	-----	-----	57	2.30
11	Screen, latrine ²	8' x 52'	416	144	-----	45	1.10

¹ Tent, general purpose, small, is a six-sided pyramidal tent. Length of side 8' 9", eave height 5', height of peak 8' 6".

² Limited standard; will be issued until exhausted.

	1	2	3	4	5	6	7
	Data on cold-weather tentage						
1	Type	Dimensions	Surface area (sq ft)	Floor space (sq ft)	Vertical wall (height)	Weight in pounds per unit (packed)	Cubage per unit (packed)
2	Arctic, 10-man..... (8340-262-3684)	8' 6" ea side (six-sided pyra- midal).	34' 6" diameter (circular tent).	198.90	3 ft	76.0	7.30
3	Hexagonal..... (8340-269-1372)	6' 7½" ea side (six- sided pyra- midal)	25' 3" diameter (circular tent).	113.20	2 ft	48.0	3.80
4	Mountain, 2-man..... (8340-254-9017)	54" wide X 82" long.	285	30.75	12 in.	9.1	0.79
5	Frame-type, insulated sectional..... (8340-262-2399).	16' long X 16' 7" wide.	868	265.30	-----	2,264.0	192.80

(3) *Space allowances for quarters under theater of operations conditions.*

(a) *Normal*—40 square feet floor space and 40 cubic feet airspace per person.

(b) *Emergency*—50 percent of the above.

(4) *Billets.* In hostile or liberated territory, the capacity of a locality for billeting is approximately as follows:

Rich farming country.....5 per inhabitant.

Cities2 per inhabitant.

Average American city.....20 per vacant dwelling.

Vacant buildings and dwellings in average city (civilians may be caused to move to vacancies in order to concentrate military activities). 10 percent of population.

With civilians furnishing subsistence. 10 percent of population for 1 week.

k. Housing Requirements in Addition to Troop Camps. In addition to those troop housing facilities provided for normal functions of troops, it is usually necessary to provide additional installations, based on the following percentages of the theater population.

	1	2
	Facility	Percentage of theater troops
2	Recreation center.....	5% of total.
3	Reception center.....	5% of total.
4	Replacement depot.....	3% of total.
5	Casual camp.....	1% of total.
6	Ground troop training center.	5% of all ground forces.
7	Service force training center.	5% of all service troops.
8	Labor camp.....	5% of prewar population in area.
9	Temporary refuge for displaced persons.	5% of prewar population in area.
10	Military prisoners.....	1% of total.
11	Undesirable civilians (saboteurs, etc.).	5% of prewar population in area.

l. Office Space. Space allowances for offices under theater of operations conditions: 60 square feet per person employed plus 10 square feet per drafting board.

m. Prefabricated and Standard-Frame Buildings.

- (1) The following are the basic units for portable prefabricated, V-lock steel buildings:
 - (a) Barrack with basic dimensions of 20, 30, or 40 feet by 50 feet by 8 feet, expandible in 10-foot length increments.
 - (b) Warehouse with basic dimensions of 40 feet by 100 feet by 12 feet, 20 feet by 20 feet bays, and expandible in 20-foot length increments.
 - (c) Shop with basic dimensions of 40 feet by 100 feet and expandible in 10-foot length increments.
 - (d) Units of (a), (b), and (c) above are interconnectable without use of especially fabricated parts.

- (2) Standard-frame buildings are constructed in various dimensions and designs from standard materials listed in TM 5-302. Because of the large lumber and man-hour requirements involved, this construction is normally restricted to special-purpose buildings, such as refrigerated warehouses, ice plants, laundries, drycleaning plants, special shops, and facilities for frigid climates.

8.10. Bulk Petroleum Storage and Distribution

a. General. See paragraphs 5.13 through 5.24 for petroleum; paragraph 5.14 for types and capacity of carriers in general use; and paragraph 7.15 for sizes and capacities of pipelines. See TM 5-350 for descriptions, sizes, and operating characteristics of pipeline equipment; AR 701-9100-1 for technical service responsibilities; and TM 10-1100-series for petroleum pipeline and terminal operating procedures and techniques. A complete pipeline system includes tanker discharge facilities and receiving tank farm at a port or beach (marine terminal); 1 or more parallel pipelines; tank farms are generally spaced from 50 to 75 miles apart along the system and vary in size from 50,000 barrels capacity to 1,000,000 barrels capacity, depending on logistical supply needs and specified theater levels of supply; dispensing facilities are provided at tank farms and supply points. Engineer troop units construct petroleum distribution systems.

b. Pipelines. Four-, six-, and eight-inch diameter, lightweight pipe is standard for military pipeline systems. On level terrain, pump stations are spaced 8 miles apart for 4 inch lines and 17 miles apart for 6-inch and 8-inch lines. Submarine ship-to-shore lines are 12-inch heavy welded lines running from the offshore tanker mooring to the receiving tank farm. They are provided by the Corps of Engineers as part of the equipment in marine terminal installations (*c* below) and should be designed to unload T2 tankers in 24 hours.

	1	2	3	4	5
1	100 miles pipeline	Short tons	Measurement tons	Construction	
				Man-hours	Rate/engineer pipeline co ¹
2	4-inch W pump stations.....	2,360	3,340	59,600	6 miles/day
3	6-inch W pump stations.....	3,230	6,330	62,500	4 miles/day
4	8-inch W pump stations.....	4,770	9,100	91,500	3 miles/day

¹ Assisted by civilian or prisoner-of-war labor.

c. Tank Farms.

- (1) To determine the amount of tank farm construction required in a theater of operations, the planner should first determine the required theater level of supply. This may vary from a 30-day level to a 60-day level, depending on the distance of tanker haul and probability of tanker losses through enemy action. Using the planning factor stated in paragraph 7.16, the amount of construction required may be estimated by the following formula:

Number of divisions (plus air support) × 6,000 barrels per day × number days level of supply—available existing storage in theater = Total storage construction requirement.

- (2) The following table provides data for

estimating tank farm construction along a pipeline system. These data include tanks, pipe manifolds to the individual tanks, pumps, valves, etc., necessary for operation of the tank farms. Current doctrine for dispersion of facilities prescribes that not over 250,000 barrels of bulk storage capacity will be constructed within 4 miles of another tank farm. Tank farm complexes listed below are groupings of 20,000-barrel or 250,000-barrel capacity installations with sufficient intermediate pipeline and accessories to meet the dispersion criteria. Marine terminals listed below are used at ports or beaches and include the receiving tank farm and all facilities for offshore mooring of tankers and pumping petroleum products to the tank farm.

	1	2	3	4	5	6
1	Installation	Capacity (thousand bbl)	Site area (thousand yd sq)	Short tons	Measurement tons	Construction man-hours
2	Marine terminal.....	200	130	1,515	1,360	48,500
3	Marine terminal.....	400	220	3,700	3,800	112,300
4	Marine terminal.....	1,000	520	7,670	7,400	242,700
5	Tank farm.....	50	50	390	230	14,100
6	Tank farm.....	100	87	595	295	21,100
7	Tank farm.....	150	89	710	345	27,600
8	Tank farm.....	200	90	760	360	34,400
9	Tank farm.....	250	120	995	410	41,500
10	Tank farm complex.....	400	180	2,180	1,712	78,500
11	Tank farm complex.....	600	270	3,495	3,055	122,500
12	Tank farm complex.....	800	360	4,760	4,335	164,800
13	Tank farm complex.....	1,000	480	5,355	4,540	193,400

d. Pipeline Communications. A petroleum distribution system requires continuous communication between tank farm dispatches, pump station operators, and pipeline patrol units. The Signal Corps provides both radio-voice and teletypewriter equipment for this communication system. Teletypewriter is used primarily for hourly recording of the flow of products along the pipeline and the transmission of dispatching instructions between tank farms (par. 4.25).

e. Pipeline Operations. Pipeline systems for distributing bulk petroleum fuels within the theater will be operated by the petroleum inter-sectional service (POLIS). The POLIS, under the operational control of the quartermaster, theater army logistical command (TALOG QM) is an intersectional and interzonal service extending from the base section as far forward into the combat zone as possible. Liquid petroleum fuels can be moved most effectively and economically in bulk form. The POLIS distribution plan maximizes the use of pipelines. Distribution of packaged petroleum fuels (5-gallon cans and 55-gallon drums) will be restricted to the extent essential for adding flexibility to the system. The quartermaster petroleum depot company, TOE 10-377, operates military terminal and pipeline facilities and performs organizational maintenance thereon. It is capable of operating two petroleum terminals, each with a maximum storage capacity of 500,000 barrels; and six pumping stations; or approximately 90 miles of pipelines. Additional terminal and pipeline operating elements may be organized as separate platoons.

8.11. Nuclear Powerplants

a. General. Nuclear powerplants can be designed to operate over extended periods without refueling, thereby reducing the logistical support effort.

b. Capacities. The Army package power reactor, utilizing a pressurized water reactor system, will produce 2,000 kilowatts of electricity and will operate for a period of 18 to 24 months on one fuel loading weighing approximately 600 pounds (fuel oil equivalent, 54,400 barrels). Nuclear plants of this type can be designed with

capacities in the range of 1,000- to 4,000-kilowatt electrical output. The heat output of the reactor can be split between electricity and steam for space heating in any ratio within the overall capability of the reactor. The approximate range of available net capacities is as follows:

	1	2	3
1	Source	Maximum electrical Minimum heating	Minimum electrical Maximum heating
2	Electrical power	4,000 kw	
3	Steam for heating		20,000 kw

c. Construction. Because of the complex nature of nuclear powerplants, highly skilled technicians are required for all construction except site preparation and building erection. The time for design and erection will average about 36 months under normal contracting procedures for military construction.

8.12. Airfield Construction

a. Construction Effort Required for Airfields in a Theater of Operations. This paragraph is useful for broad planning purposes only. For oversea theaters, it provides estimates for computing engineer troop support required to construct U. S. Air Force installations. None of the factors in this section is suitable for the detailed planning required for construction of specific installations. Reference should be made to AFM 86-3 and TM 5-250 for more detailed planning data.

- (1) The table below gives the number of engineer battalion months required to accomplish emergency, minimum, and full operational construction of different-type bases. A factor of 75 percent of total construction of a new base can be used to estimate the average construction required to reconstruct an existing base which makes use of a site where an airfield of some type does exist or has existed. These are average factors. They are not applicable to extreme climatic conditions and mountainous or swampy terrain.

	1	2	3	4	5
1	Type base	Critical aircraft ¹	New base		
			Emergency operational	Minimum operational	Full operational
2	Heavy bomber: One wing.....	B-52	12.0	18.0	30.0
3	One squadron.....		10.0	15.0	18.0
4	Medium bomber: One wing.....	B-47	11.0	16.0	27.0
5	One squadron.....		10.0	14.0	22.0
6	Tactical bomber: One wing.....	B-66	9.0	11.0	15.0
7	One squadron.....		8.0	10.0	13.0
8	Tactical fighter or fighter interceptor: One wing.....	F-105	6.0	9.0	13.0
9	One squadron.....		5.0	8.0	11.0
10	Transport, heavy: One wing.....	C-97	9.0	11.0	15.0
11	One squadron.....		8.0	10.0	13.0
12	Transport, medium: One wing.....	C-119	2.5	6.0	12.5
13	One squadron.....		2.0	4.0	6.5
14	Troop carrier, assault: One squadron.....	C-123	1.5	2.5	5.0
15	Air depot: One wing on base operating own base.....		11.0	19.5	37.5
16	One wing on base as tenant organization.....		4.0	12.5	29.0

¹ Aircraft requiring longest runway in each category.

(2) The number of engineer heavy construction battalion months required to construct the different type bases is calculated from the man- and equipment-hour workload needed to build each base. This is determined by specifying for each type base the kinds and numbers of facilities required for the performance of the function of the units supported by the base; i.e., AACS station, housing, runway, etc. Each of these facilities is then broken down into the kinds and number of elements composing it; i.e., paved surfaces, shops, messhalls, and latrines. A man- and equipment-hour factor, such as 1.45 hours per square yard of paved surface, is then applied to each of these elements to compute the total man-hours required to construct each element. The number of hours for all

elements is then added together to give the total man- and equipment-hours required to construct the base. This total is then converted to heavy construction battalion months by the factor; 140,000-man- and equipment-hours of construction is equivalent to one engineer heavy construction battalion month.

b. Conversion of Battalion Months of Effort to Engineer Battalion. In order to compute manning, training, and equipping requirements, it is necessary to convert engineer battalion months as given above to heavy construction battalions. Thus, a construction task requiring 8 engineer heavy construction battalion months can be accomplished by 1 engineer heavy construction battalion working for 8 months, 2 battalions for 4 months, or 4 battalions for 2 months, etc. In emergencies, immediate and urgent requirements may develop for the con-

struction of complex installations such as a heavy bomber base. Theoretically, this could be done by concentrating enough battalions in the area to perform the required number of months of construction. However, the effect of over-saturation comes into play, and the efficiency of the work diminishes as the personnel, equipment, and supplies of the different battalions create interference. On the basis of these saturation considerations, the following table presents estimates of the number of battalions which can be employed most efficiently.

	1	2
1	Battalion months of construction effort required	Number of battalions best utilized
2	25-35	4
3	15-24	3
4	5-14	2
5	Less than 4	1

8.13. Signal Construction Factors

a. Estimated Time Required for Line Work Operations.¹

	1	2	3
1	Operation	Man-hours placing	Removing
	Laying out and staking line open wire:		
2	150-foot span—mile	15.0	
	Material distribution:		
3	Lightweight metal poles—each.	0.4	
4	Round wooden poles—each.	0.5	
5	Wire and accessory materials 150-foot span—4 pairs—mile.	6.0	
6	Insulated wire and accessory materials—150-foot span—mile.	2.0	
7	Lead cable and accessory materials—per reel.	1.8	
	Holes—pole:		
8	Dug by hand—per hole	3.0	
9	Dug by machine—per hole	0.5	
10	Dug by blasting, hand drilling—per hole	5.0	
	Holes—anchor:		
11	Dug by hand—4 x 4 log—each	3.0	

	1	2	3
1	Operation	Man-hours placing	Removing
12	Dug by machine—log or plank—each	0.7	
13	Dug by machine—patent—each	0.8	
14	Dug by hand— $\frac{5}{8}$ -inch rock—each	3.0	
	Assembling hardware and placing crossarm—open wire:		
15	Lightweight metal—4 pins—each	0.3	0.2
16	Round wood pole—8 pins—each	0.5	0.2
	Setting poles (erecting, back-filling, and tamping):		
17	Lightweight metal—each	0.4	0.3
18	20-foot round—each	2.0	1.0
19	30-foot round—each	2.5	1.2
	Guying:		
	Placing anchor and back-filling:		
20	Lightweight metal poles—each	0.6	
21	Round pole log or plank—each	3.0	
22	Patent—each	2.0	
	Placing and tensioning guying:		
23	W-145, 109 GS, or similar—each	1.0	0.6
24	Wire messenger, 2.2M—each	1.5	0.8
25	Wire messenger, 6M or 10M—each	2.5	1.0
	Installing line wire (placing, sagging, and tying in):		
26	1 pair—mile	25.0	13.0
27	4 pair—mile	40.0	18.0
	Installing messenger wire:		
28	6 and 10M messenger—mile	36.0	30.0
29	16M messenger—mile	50.0	40.0
	Placing lead-covered cable on messenger:		
30	11 to 101 pair—mile	125.0	80.0
31	Above 101 pair—mile	164.0	116.0
32	Placing insulated wire on existing pole line—mile	12.0	7.0
	Ground surface construction:		
33	Spiral—4—mile ²	2.6	2.6
34	Wire, W-143, or similar—mile ²	2.2	2.0

See footnotes at end of table.

1	1	2	3
	Operation	Man-hours placing	Removing
	Buried construction (using cable plow, LC-61:) ³		
	Spiral-4:		
35	1 cable—mile-----	8.5	3.0
36	2 cables, same trench —mile-----	12.0	5.0
37	Jute-covered, tape- armored—mile-----	45.0	65.0
38	Constructing overhead crossing for insulated wire each (in- stalling messenger and rings, pulling in wire)-----	5.2	-----

¹Time indicated is maximum for any operation.

²For surveying, staking line, testing sections, and policing, add 12 man-hours per mile for spiral-4 and 6 man-hours per mile for wire, W-143.

³Does not cover operations in jungle, arctic, or desert areas.

b. Characteristics of Round Telephone Poles (American Standard).

Class		1	2	3	4	5	6	7
Minimum top circumference (inches)-----		27	25	23	21	19	17	15
Transverse breaking loads (pounds)-----		4,500	3,700	3,000	2,400	1,900	1,500	1,200
Western cedar, northern cedar, creosoted pine.	20	700	600	500	400	300	225	200
		720	600	540	350	300	230	190
		635	555	479	418	353	310	259
	25	850	720	600	480	400	320	250
		1,020	780	600	515	420	300	250
		898	808	686	602	508	423	362
	30	1,000	850	730	610	500	420	350
		1,320	1,170	870	630	520	420	350
		1,241	1,076	921	780	672	573	489
	35	1,200	1,000	850	750	650	560	470
		1,620	1,380	1,060	820	720	510	450
		1,603	1,410	1,213	996	865	733	616

Northern and western cedars are furnished butt treated; pine is treated full length. An estimate of the shipping space required for poles:

$$\frac{\text{Average weight (pounds)} \times \text{constant}}{40} = \text{Measurement tons.}$$

Values of the constant are—

Cedars = 0.052.

Pine = 0.026.

c. Comparison of the Means To Obtain Telephone Channels—100 Miles.

Channel	Construction time in man-days ¹	Short tons	Measurement tons
Radio relay, 4-channel ² ----	³ 65	10	26
Radio relay, 12-channel ² ----	³ 85	53	279
Radio relay, 24-channel ² ----	³ 125	53	279
CF carrier on spiral-4 (buried):			
Total 4 channels----	285	50	75
CF carrier on spiral-4 (suspended):			
Total 4 channels----	440	50	75
O carrier on open wire (lightweight metal poles and crossarms)—2 systems:			
Total 16 channels ⁴ ----	105	187	192
C carrier on standard open wire (30-foot poles spaced 150 feet)—4 systems:			
Total 16 channels ⁴ ----	⁵ 10,060	6,204	9,846
O carrier on standard open wire (30-foot poles spaced 150 feet):			
Total 32 channels ⁴ ----	⁵ 10,120	6,204	9,846

¹ Does not apply to operations in jungle, arctic, or desert.

² Repeater spacing, approximately 25 miles.

³ Includes only actual time to install equipment (including antennas and system lineup).

⁴ Repeater spacing, approximately 100 miles.

⁵ Construction time is based on signal construction battalion day consisting of 500 man-days and completion of 5 miles of open wire per day.

d. Commercial-Type Telephone Switchboard Capacity—Position Comparison.

Local switchboard capacity—lines	Positions
100 -----	1 or 2
400 -----	7 basic
600 -----	10 basic
800 -----	11 basic
1,000 -----	14 basic
1,200 -----	16 basic
1,600 -----	22 basic
2,000 -----	27 basic
2,800 -----	40 basic
3,600 -----	60 basic
Toll switchboard capacity—lines	Positions
100 -----	15
200 -----	25
300 -----	34
400 -----	40

e. Local (Common Battery Manual) Call Handling Time and Traffic Distribution.

(1) *Call handling time.*

One operator handles 150 calls per operator hour.

Two operators handle 200 calls per operator hour.

Three operators handle 220 calls per operator hour.

Four operators handle 225 calls per operator hour.

Five or more operators handle 230 calls per operator hour.

(2) *Distribution of traffic (average situation).*

	Percentage
Local calls -----	40
Outgoing trunk calls -----	30
Incoming trunk calls -----	30

f. Toll (Common Battery Manual) Call Handling Time and Traffic Distribution.

(1) *Call handling time.*

One operator handles 20 calls per operator hour.

Two operators handle 25 calls per operator hour.

Three operators handle 30 calls per operator hour.

Four operators handle 35 calls per operator hour.

Five operators handle 40 calls per operator hour.

(2) *Distribution of traffic (average situation).*

	Percentage
Outward -----	55
Inward -----	30
Through (switchboard) -----	15

g. Normal Telephone Instrument Requirements.

- (1) One per general officer.
- (2) One per two field grade officers.
- (3) One per four company grade officers.
- (4) One per 50 or 100 enlisted men, depending on whether troop basis is on TOE basis or personnel are operating as part of a large headquarters staff.

h. Space Requirements.

Line capacity	Switchboard positions	Space requirements—square feet
Common battery manual telephone switchboard (fixed plant):		
100 -----	1	250
100 -----	2	275
200 -----	2	300
200 -----	4	500
600 -----	10	1,380
800 -----	11	1,520
1,000 -----	14	1,900
1,200 -----	16	2,280
1,600 -----	22	2,764
2,000 -----	27	3,400
2,800 -----	40	4,760
Fixed communication center:		
Small -----		950
Medium -----		1,900
Large -----		3,000

Fixed radio-transmitter

station:	
Small -----	2,300
Medium -----	4,425
Large -----	5,500

Fixed radio-receiver

station:	
Small -----	1,550
Medium -----	3,600
Large -----	4,450

Antenna field:¹

	Acres
Transmitter:	
Small (2-6 antennas) -----	6 to 30
Medium (9 antennas) -----	35 to 100
Large (20 antennas) -----	100 to 400
	Acres
Receiver:	
Small (2 antennas) -----	6
Medium (20 antennas) -----	100 to 300
Large (35 antennas) -----	200 to 600

¹ Space is based on average conditions existing; however, depending on type antennas, equipment used, location, and terrain, space requirements may vary.

Section III. MAINTENANCE

8.14. General

This section contains maintenance planning data for staff officers on division, corps, field army, theater army logistical command, area command, and theater staffs within a theater of operations.

8.15. Maintenance Personnel Requirements

a. *General.* The following factors are useful in determining personnel requirements for maintenance support of materiel, computation of workloads and backlogs, and programing and scheduling of maintenance operations:

- (1) Supported equipment density.
- (2) Repair frequency. (This may be expressed as the number or percentage of items of equipment to be repaired within the operational work cycle; i.e., month or year.)

- (3) Maintenance man-hours per item per operational work cycle.

- (4) Productive man-hours per repairman per operational work cycle. (This includes *only* direct man-hours applicable to the maintenance workload. Nonproductive time will include unit or team movement time; lost time caused by casualties; and other non-MOS tasks such as guard, perimeter defense, and area damage control duties.)

b. Quantitative Personnel Requirements.

- (1) The factors listed in a above may be employed in formulas to determine quantitative personnel requirements as follows:

$$\text{Supported equipment density} \times \frac{\text{Repair frequency per operational work cycle}}{\text{Workload (items) per operational work cycle}} = \text{Workload (items) per operational work cycle}$$

$$\frac{\text{Available man-hours per operational work cycle}}{\text{Nonproductive time (man-hours)}} = \text{Productive man-hours per operational work cycle}$$

$$\frac{\text{Workload (items) per operational work cycle} \times \text{Maintenance man-hours per item per operational work cycle}}{\text{Productive man-hours per operational work cycle}} = \text{Maintenance personnel required}$$

The final product is the total number of repairmen required to support a given number and type of items of equipment in an organization. Whether the number of personnel required are field or organizational repairmen will depend upon the factors used.

- (2) The number of maintenance repairmen required to support all the equipment in an organization for a given level of maintenance is the sum of those required for each type of equipment. If this sum is not a whole number, the suggested authorization is as follows:

Range of sum	Authorization
0.00- 0.49	0
0.50- 1.09	1
1.10- 2.09	2
2.10- 3.49	3
3.50- 4.49	4
4.50- 5.49	5
5.50- 6.49	6
6.50- 7.49	7
7.50- 8.49	8
8.50- 9.49	9
9.50-10.49	10
etc.	etc.

- (3) Maintenance time factors for selected items and types of equipment for the various technical services are listed in tables I, II, and III, below.

c. *Qualitative Personnel Requirements.*

- (1) Personnel are allocated by the various MOS codes in conformance with the type of work to be performed. Determination of the number of repairmen of a given MOS required by an organization may be made by adding together the number of repairmen required for each type of equipment of

that organization to which the given MOS is applicable.

- (2) In addition to the various light- and heavy-equipment repairmen required, certain common- or service-type specialists must be provided. While these personnel are required, they normally cannot be considered to be 100 percent productive. Therefore, they should be applied against the total allocation of personnel spaces, based on a 25 percent nonproductivity factor.

d. *Other Functions.*

- (1) *Inspections.* Technical inspection of materiel and equipment is performed by staff or supervisory personnel of the technical service as appropriate.
- (2) *Technical assistance.* Technical assistance to supported units is provided by liaison, supervisory, and contact repair team personnel in the normal course of their duties. Therefore, time required for this function by non-supervisory personnel is included in the repair time factors that are quoted.
- (3) *Parts supply.* Personnel required to provide repair parts and maintenance operating supplies will vary, depending on equipment density and utilization. These factors will be reflected in the unit's authorized stockage list. As a general guide, one parts stock control specialist should be authorized for each 750 line items or major fraction thereof. Storage personnel must be allocated in accordance with the weight and volume of materiel to be handled.

Table I. Maintenance Time Factors for Selected Items of Equipment

1	2	3	4	5	6
Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
<i>Chemical²</i>					
Light equipment:					
2 Mask, protective, fld, M9A1.....	4.00	1.00	4.00	0.17	0.67
3 Detector kit, cml agent, M18.....	4.00	1.00	4.00	0.17	0.67
Medium equipment:					
4 Compressor, reciprocating, power-driven, 7 CFM, M1A1.....	15.00	10.00	4.00	6.00	24.00
5 Filter unit, gas particulate, tk, 3-man, 12 CFM, M8A2.....	7.00	15.00	2.00	6.00	12.00
6 Flamethrower, ptbl, M2A1-7.....	15.00	30.00	3.00	2.00	6.00
7 Flamethrower, ptbl, one-shot, M8.....	5.00	10.00	6.00	2.00	12.00
8 Genr, smoke, mech, pulse-jet, M3A3.....	30.00	10.00	3.00	4.00	12.00
Heavy equipment:					
9 Decon apparatus, power-driven, tlr-mtd, 200-gal M8A2.....	30.00	10.00	3.00	8.00	24.00
10 Decon apparatus, power-driven, trk-mtd, 400-gal, M9.....	30.00	10.00	3.00	8.00	24.00
11 Flamethrower, mechanized, main armt, turret-mtd, M7A1-6 (M48A2 tk).....	30.00	30.00	4.00	12.00	48.00
12 Heater, water, oil, skid-mtd, 600 GPH, M2.....	30.00	10.00	4.00	3.00	12.00
13 Svc unit, flamethrower, trk-mtd, ABC, M4A1.....	30.00	30.00	6.00	6.00	36.00
<i>Engineer</i>					
14 Air conditioner, 9,000-36,000 Btu.....		5.10			42.50
15 Air conditioner, W cooling tower, 60,000 Btu.....		5.30			34.50
16 Air conditioner, tlr-mtd, gas-eng driven, 26,500 Btu.....		6.30			27.50
17 Auger, earth, skid-mtd, gas-eng driven.....		5.30			66.00
18 Asphalt mixing and paving set, 120 tons/hr.....		262.80			3,334.00
19 Backhoe, crane-shovel, $\frac{3}{8}$ -2 cu yd.....		12.50			53.50
20 Batching plant, agg, 100-ton.....		3.20			87.00
21 Batching plant, cement, 75-ton.....		1.30			134.50
22 Boat, brg erection, 19-27-ft, gas-eng driven.....		15.60			51.50
23 Boiler, steam, high-pressure, tlr-mtd, 200 HP.....		51.40			249.00
24 Breaker, paving, gas-eng driven, 100-lb class.....		16.00			53.00
25 Breaker, paving, pneumatic, 25-80-lb class.....		3.20			11.50
26 Bucket, clamshell, $\frac{3}{8}$ -2 cu yd.....		4.50			15.00
27 Compressor, air, elec, 1.2-16 CFM.....		3.80			22.00
28 Compressor, air, elec, 18-60 CFM.....		4.60			27.00
29 Compressor, air, reciprocating, gas-eng driven, 15-55 CFM.....		5.10			66.00
30 Compressor, air, reciprocating, gas-eng driven, 60-105 CFM.....		5.80			41.00
31 Compressor, air, rotary, 125-315 CFM.....		6.30			46.00
32 Compressor, air, rotary, 600 CFM.....		10.80			51.50
33 Compressor, air, rotary, 60 CFM.....		3.80			28.00

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

	1	2	3	4	5	6
1	Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
	<i>Engineer—Continued</i>					
34	Conversion and stor unit, carbon-dioxide, 16,000-lb cap		11.40			70.00
35	Conversion unit, carbon-dioxide, 260 lb/hr, elec		24.20			65.00
36	Conveyer, belt, pneumatic tires, elec (all)		3.20			40.50
37	Conveyer, belt, pneumatic tires, gas-eng driven, 300 tons/hr (all)		19.20			34.50
38	Cooling tower, liq, elec, 4 sec		11.50			51.00
39	Crane-shovel, crawler-mtd, 5-10 ton		34.80			70.50
40	Crane-shovel, crawler-mtd, 40-ton		58.80			97.50
41	Crane-shovel, trk-mtd, 2-10 ton		35.80			171.50
42	Crane-shovel, trk-mtd, 20-25-ton		76.80			214.50
43	Crane, tractor mounting, 2½-6-ton		2.20			12.00
44	Crane, tractor, towed, 10-20-ton		1.30			7.50
45	Crusher, jaw, gas-eng driven, 15-ton		31.30			98.50
46	Crushing and screening plant, gas-eng driven, 25 cu yd		63.80			181.50
47	Crushing and screening unit, gas-eng driven, crawler-mtd, 100 tons/hr		123.00			90.50
48	Crushing, screening, and washing plant, diesel and elec, 225 tons/hr		241.80			217.00
49	Distillation eqp set, skid-mtd, diesel-eng driven, 150-300 GPH		32.10			56.50
50	Distillation eqp set, skid-mtd, gas-eng driven, 40-60 GPH		29.90			54.50
51	Distributor, bituminous material, tk-type, gas-eng driven, tlr-mtd, 1,250-gal		14.90			11.50
52	Distributor, bituminous material, tk-type, gas-eng driven, trk-mtd, 800-gal		11.30			13.50
53	Distributor, liq, bituminous material, tankless-type, gas-eng driven, 350 GPM		7.40			7.50
54	Distributor, water, tk-type, gas-eng driven, trk-mtd, 1,000-gal		14.90			28.00
55	Distributor, water, tankless-type, gas-eng driven, tlr-mtd, 400 GPM		7.30			15.50
56	Ditching machine, gas-eng driven, crawler-mtd		16.30			30.00
57	Drill, pneumatic, drifter, wheel-mtd, 220-lb class		1.30			6.50
58	Drilling machine, percussion, skid-mtd, gas-eng driven		2.70			62.50
59	Drilling machine, rotary, skid-mtd, gas-eng driven, 4⅞-5⅞-in		3.30			66.50
60	Drive unit, aerial tramway-cableway, gas-eng driven		13.10			71.00
61	Dryer, agg, gas-eng driven, tlr-mtd, 30 tons/hr		11.30			16.50
62	Dryer, agg, gas-eng driven, tlr-mtd, 120 tons/hr		12.30			50.00
63	Elevator, bucket-type, gear-driven, 80-150 tons/hr		1.30			13.50
64	Fairlead attachment, 2-40-ton		0.70			7.50

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

1	1	2	3	4	5	6
	Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
	<i>Engineer—Continued</i>					
65	Feeder, agg, chain-driven, 400 tons/hr.....		1.30			16.50
66	Finishing machine, concrete-paving, gas-eng driven, 20-25 ft.....		4.50			21.50
67	Fire and salv eqp set, marine.....		77.60			210.00
68	Fire-fighting eqp set No. 3, tlr-mtd, 500 GPM.....					65.50
69	Fire-fighting eqp set No. 21, Army acfr crash, trk-mtd.....					83.00
70	Fire-fighting eqp, GM, tlr-mtd, 100 GPM.....					52.50
71	Fire-fighting eqp, trk-mtd, W tlr, REDSTONE.....					105.50
72	Genr and chg plant, acetylene, stlr-mtd.....		102.60			107.50
73	Genr and chg plant, carbon-dioxide, stlr-mtd.....		41.80			85.00
74	Genr and chg plant, hydrogen-carbon-dioxide, W genr.....		116.90			261.50
75	Genr and chg plant, oxy-nitrogen, 20-ton, liq-oxy.....		242.60			241.00
76	Genr and chg plant, oxy-nitrogen, 5-ton, liq-oxy.....		204.20			251.00
77	Genr and chg plant, oxy-nitrogen, W genr.....		64.90			162.00
78	Genr set, gas-eng driven, 0.5-3 kw.....		14.80			20.00
79	Genr set, diesel-eng driven, 15-60 kw.....		20.30			107.00
80	Genr set, diesel-eng driven, 100-500 kw.....		35.20			116.00
81	Genr set, gas-eng driven, 5-10 kw.....		18.30			69.50
82	Gradation con unit, agg, tlr-mtd.....		15.70			40.50
83	Grader, road, towed, 6 ft 6 in. blade.....		3.20			28.00
84	Grader, road, mtz, diesel-eng driven, 6x4.....		36.10			94.50
85	Grader, road, mtz, diesel-eng driven, 4x4.....		38.50			112.50
86	Heater, bitumen, gas-eng driven, 3-car.....		6.50			16.50
87	Heater, concrete mixer, hot water, 800 GPH.....		5.00			17.50
88	Hypochlorination unit.....		3.50			
89	Ice-making plant, block, 3-15 tons/hr.....					79.00
90	Intrenching machine, cmbt, high-speed, wheel-mtd.....		34.30			115.50
91	Kettle, heating, bitumen, gas-eng driven, 750-gal.....		4.70			17.00
92	Kettle, heating, bitumen, gas-eng driven, tlr-mtd, 165-gal.....		3.80			15.50
93	Launcher, M48 tk chassis, for 40- and 60-ft brg.....		3.20			47.50
94	Loader, belt-type, diesel-eng driven, 10-30 cu yd/min.....		3.60			62.00
95	Loader, bucket-type, diesel- or gas-eng driven, 3 cu yd/min.....		32.20			67.50
96	Loader, scoop-type, diesel-eng driven, 4-wheel, 1½-2½ cu yd.....		34.60			44.50
97	Logging eqp set, trk-mtd.....		11.80			41.00
98	Lubricating and svc unit, tlr-mtd, gas-eng driven.....		5.40			28.00
99	Magnet, sweeper, road, W gas-eng driven genr.....		2.50			45.00
100	Mine-planting eqp, mech.....					27.00
101	Mixer, bituminous material, diesel-eng driven, tlr-mtd.....		11.30			55.00

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

1	2	3	4	5	6
Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
<i>Engineer—Continued</i>					
102 Mixer, bituminous material, gas-eng driven, tlr-mtd.....		6.60			32.50
103 Mixer, concrete, tlr-mtd, gas-eng driven, 6-16 cu ft.....		5.30			28.50
104 Mixer, rotary tiller, diesel-eng driven, SP.....		7.80			62.00
105 Mixer, rotary tiller, gas-eng driven, tlr-mtd.....		5.40			59.00
106 Outboard motor, 5-25 BHP.....		4.80			25.00
107 Paver, concrete, gas-eng driven, 34E.....		70.30			166.50
108 Paving machine, bituminous material, gas-eng driven, crawler-mtd.....		28.80			150.00
109 Pipeline eqp set, const, trk-mtd.....		13.00			22.50
110 Planter, mech, landmine.....					27.50
111 Pneumatic tool and compressor outfit, tlr-mtd, 55 CFM.....					20.50
112 Pneumatic tool and compressor outfit, trk-mtd, 210 CFM.....		25.90			26.00
113 Power unit, gas, 50-55 BHP.....		1.90			32.00
114 Pump assy, rotary, power-driven or percussion.....		16.80			15.00
115 Pump, centrifugal, base-mtd, elec-driven, 1/2-2 HP.....		1.60			49.50
116 Pump, centrifugal, deep-well, gas-eng driven, 200 GPM, 200-ft head.....		16.80			31.50
117 Pump, centrifugal, frame-mtd, gas-eng driven, 50-115 GPM.....		5.20			29.50
118 Pump, centrifugal, gas-eng driven, base-mtd, 60-166 GPM.....		13.00			27.00
119 Pump, centrifugal, gas-eng driven, base-mtd, 175-500 GPM.....		19.20			27.00
120 Pump, centrifugal, gas-eng driven, tlr-mtd, 500-2,100 GPM.....		22.30			37.00
121 Pump, centrifugal, pneumatic-driven, 150-175 GPM.....		11.10			14.50
122 Rehab plant, landing-mat, PSP.....					28.00
123 Roller, mtz, gas-eng driven, med to hv.....		25.20			55.00
124 Roller, towed, pneumatic-tired, 4-wheel, hv.....		6.70			3.00
125 Roller, towed, pneumatic-tired, 13-wheel.....		8.50			7.00
126 Roller, towed, sheepsfoot, 2 and 3 drums.....		3.80			2.50
127 Rooter, road, cable-op, 24-in. depth.....		3.80			2.50
128 Saw, chain, gas-eng driven, 24-36-in.....		3.80			14.50
129 Saw, chain, elec-driven, 24-in.....		1.60			3.00
130 Saw, chain, pneumatic, 24-in.....		1.90			5.00
131 Saw, radial, overarm, wood-working, 10-16-in. blade.....		2.60			15.50
132 Sawmill, circular, stationary, 50-60-in. blade.....		2.80			43.50
133 Scraper, earth-moving, towed, 12-18 cu yd.....		9.40			8.50
134 Stlr, elec rep shop, 6-ton.....		4.90			1,588.00
135 Stlr, maint, mach shop, 12-ton.....		6.30			3,121.00

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

1	2	3	4	5	6
Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
<i>Engineer—Continued</i>					
136 Stlr, rep parts, shop van, 6-ton		4.50			29.50
137 Stlr, tk, 6-ton, 1,500-gal		5.90			9.00
138 Shop eqp, contact maint, trk-mtd		4.30			1,553.00
139 Shop eqp, GP rep, stlr-mtd		24.50			3,101.00
140 Shop eqp, org rep, lt, trk-mtd		6.30			3,100.00
141 Shop eqp, wood-working, base-maint, tlr-mtd		20.40			63.50
142 Shovel front, crane-shovel, crawler-mtd, $\frac{3}{8}$ -2 cu yd		3.60			27.00
143 Snow-removal unit, gas-eng driven, trk-mtd					138.00
144 Spray outfit, paint, one-gun, W compressor (all)		4.60			26.50
145 Spreader, agg, towed, 8-ft spread		2.20			9.00
146 Spreader, concrete, gas-eng driven, 25-ft spread		19.20			18.00
147 Spreader, sand, traction-powered, 25-ft spread (all)		1.90			14.00
148 Stor and transport unit, dry ice, 1-ton		1.30			15.50
149 Subgrader, formriding, gas-eng driven, 25-ft range		21.40			61.50
150 Sweeper, rotary, towed, gas-eng driven		6.00			7.50
151 Tamper, back-fill, pneumatic		1.30			2.50
152 Tank, asphalt stor, W steam coils, 4,000-gal		3.60			2.00
153 Tank, stor, liq-oxy, stlr-mtd, 9-ton		11.40			47.00
154 Tank, stor, liq-oxy, skid-mtd, 35-ton		11.40			24.50
155 Tool outfit, pioneer, ptbl elec tools		18.20			73.00
156 Tractor, full-tracked, diesel-eng driven, air-trans		27.50			107.00
157 Tractor, full-tracked, diesel-eng driven, med		33.20			139.00
158 Tractor, full-tracked, diesel-eng driven, 12,100-17,000 DBP		33.20			119.00
159 Tractor, full-tracked, diesel-eng driven, hv		34.60			139.00
160 Tractor, walking, power-driven, wheel-mtd, 20 HP		19.30			27.00
161 Tractor, wheeled, ind, diesel-eng driven, 20,025-27,000 DBP		34.60			157.00
162 Tractor, wheeled, ind, gas-eng driven, 3,000-7,775 DBP		27.50			51.00
163 Tlr, bolster, 2½-ton		6.50			4.50
164 Tlr, bolster, 9-ton		5.40			5.50
165 Tlr, ego, ¼-3-ton		3.80			6.50
166 Tlr, flat-bed, 8-10-ton		5.40			9.00
167 Tlr, low-bed 60-ton		6.30			9.00
168 Tlr, tk, 1,500-gal		5.90			9.50
169 Tlr, tractor, dump, diesel-eng driven, 13 cu yd		44.00			154.50
170 Tramway set, aerial, gas-eng driven, 1,500-3,000-ft					39.00
171 Trk, bolster, 2½-ton		2.60			4.50
172 Trk, dump, 15-ton, diesel-eng driven		27.50			156.50
173 Trk, flat-bed or stake, 5-ton		3.30			3.00
174 Trk, map repro, 2½-ton (all)		6.00			17.50

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

1	Item or type of equipment	2	3	4	5	6
		Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
	<i>Engineer—Continued</i>					
175	Water purification eqp set, 600 GPH, tlr-mtd.....		17.80			38.50
176	Water purification eqp set, 1,500 GPH, trk-mtd.....		24.30			78.00
177	Water purification eqp set, 3,000 GPH, base-mtd, trk-mtd.....		24.30			56.50
178	Winch drum, power-op, gas-eng driven, 2-drum single speed, 1¼-2-ton.....		5.40			22.00
179	Winch drum, power-op, diesel-eng driven, 5¼-ton.....		1.30			46.50
180	Winch drum, power-op, gas-eng driven, 4-drum.....		5.50			51.50
	<i>Medical</i>					
181	Tech med eqp (all) ^{3 4}	0.50	1.00	3.00	6.00	18.00
	<i>Ordnance⁵</i>					
182	Wheeled vehicles.....	15.00	16.67	1.00	7.50	90.00
183	Tracked vehicles.....	60.00	41.67	2.00	18.75	225.00
184	Arty.....	15.00	11.67	2.00	5.00	60.00
185	Instruments.....	5.00	0.67	1.00	0.03	0.40
186	Small arms.....	15.00	0.03	1.00	0.03	0.40
	<i>Quartermaster⁶</i>					
	Light equipment:					
187	Burner, oil stove, tent.....	1.00	Negl	2.00	0.50	1.00
188	Heater, duct-type, 250,000 Btu.....	30.00	Negl	5.00	10.00	50.00
189	Heater, immersion-type.....	7.50	Negl	1.00	0.50	0.50
190	Heater, space, coal or oil.....	0.50	Negl	1.00	1.00	1.00
191	Heater, water, immersion.....	7.50	Negl	6.00	0.50	3.00
192	Lantern, gas, 1½-pt cap.....	7.50	Negl	2.00	1.00	2.00
193	Outfit, cooking, small det.....	0.25	Negl	1.00	1.00	1.00
194	Sewing machines (all).....	7.50	Negl			
195	Stove, gas, one-burner.....	0.25	Negl	1.00	1.00	1.00
	Heavy equipment:					
196	Bakery plant, tlr-mtd.....	15.00	15.00	2.00	20.00	40.00
197	Bath unit, tlr-mtd, 24-showerhead.....	15.00	5.00	4.00	60.00	240.00
198	Cleaning machine, fuel can/drum.....	15.00	1.00	2.00	10.00	20.00
199	Clothing rep shop, tlr-mtd.....	15.00	5.00	2.00	20.00	40.00
200	Crane-truck, whs.....	15.00	5.00	2.00	8.00	16.00
201	Delousing outfit.....	15.00	1.00	2.00	4.00	8.00
202	Ldry, mbl, 2-tnr type.....	15.00	20.00	4.00	40.00	160.00
203	Pumping assy, 50 GPM.....	15.00	2.00	2.00	3.00	6.00
204	Pumping assy, 225 GPM.....	15.00	4.00	2.00	8.00	16.00
205	Pump (1,200-gal tk trk).....	15.00	1.00	6.00	1.00	6.00
206	Pump (5,000-gal tlr).....	15.00	2.00	2.00	8.00	16.00
207	Stlr, refrg, 7½-ton.....	15.00	11.00	1.00	15.00	15.00
208	Shoe rep shop, tlr-mtd.....	15.00	5.00	2.00	20.00	40.00

See footnotes at end of table.

Table I. Maintenance Time Factors for Selected Items of Equipment—Continued

	1	2	3	4	5	6
	Item or type of equipment	Man-hours required for preventive maintenance per month ¹	Man-hours required for organizational maintenance per month ¹	Number of times field maintenance performed per year	Man-hours required for field maintenance per job	Total man-hours required for field maintenance per year
	<i>Quartermaster⁶—Continued</i>					
	<i>Heavy equipment—Continued</i>					
209	Textile rep shop, tlr-mtd.....	15.00	5.00	2.00	20.00	40.00
210	Tractor, wheeled, whs, 4,000- and 7,500-lb.....	15.00	3.00	4.00	12.00	48.00
211	Trk, lift, fork, gas, 4,000- and 4,500-lb.....	15.00	3.00	4.00	12.00	48.00
212	Trk, lift, fork, gas, 6,000-lb.....	15.00	4.00	4.00	12.00	48.00
213	Trk, lift, fork, gas, 15,000-lb.....	15.00	5.00	4.00	18.00	72.00
	<i>Canvas and leather items:</i>					
214	Fly tent, wall, large.....	Negl	Negl	1.00	0.50	0.50
215	Liner, tent, GP, large.....	Negl	Negl	1.00	2.00	2.00
216	Paulin (all types).....	Negl	Negl	2.00	0.50	1.00
217	Shelter half.....	Negl	Negl	5.00	0.25	1.25
218	Tent, aerial cable splicer.....	Negl	Negl	1.00	0.75	0.75
219	Tent, comd post; maint shelter; and GP, med.....	Negl	Negl	1.00	3.00	3.00
220	Tent, GP, large.....	Negl	Negl	1.00	4.00	4.00
221	Tent, kitchen, flyproof.....	Negl	Negl	1.00	0.50	0.50
222	Tent, wall, large.....	Negl	Negl	1.00	2.50	2.50
223	Tent, wall, small.....	Negl	Negl	1.00	1.50	1.50
	<i>Textile items:</i>					
224	Armor, body.....	Negl	Negl	0.25	3.00	0.75
225	Bag, barracks.....	Negl	Negl	0.10	0.25	0.025
226	Bag, carrying, ammo.....	Negl	Negl	0.15	0.50	0.075
227	Bag, duffel; canvas, water, sterile; and water, canvas, duck.....	Negl	Negl	0.15	0.25	0.0375
228	Bag, waterproof, cloth.....	Negl	Negl	0.05	0.25	0.0125
229	Belt, cartridge.....	Negl	Negl	0.15	0.25	0.0375
230	Belt, pistol; and magazine, BAR.....	Negl	Negl	0.10	0.25	0.025
231	Blanket, bed, olive-green, $\frac{3}{4}$ -lb.....	Negl	Negl	0.25	0.50	0.125
232	Carrier, wire cutter and intrench shovel.....	Negl	Negl	0.15	0.25	0.0375
233	Case, canvas, dispatch.....	Negl	Negl	0.05	0.50	0.025
234	Case, first aid.....	Negl	Negl	0.10	0.25	0.025
235	Cover, canteen.....	Negl	Negl	0.15	0.10	0.015
236	Fld pack, ego and cmbt.....	Negl	Negl	0.10	0.50	0.05
237	Personal clothing ⁷					
238	Pocket, ammo magazine.....	Negl	Negl	0.10	0.50	0.05
239	Poncho.....	Negl	Negl	0.10	0.75	0.075
240	Sleeping bag.....	Negl	Negl	0.20	0.50	0.10
241	Sling, carrying bag.....	Negl	Negl	0.10	0.10	0.01
242	Suspenders, fld pack.....	Negl	Negl	0.10	0.25	0.025

¹ A month is based on 30 working days.

² Does not include maintenance required for truck, tank, or trailer chassis.

³ See SR 742-607-1.

⁴ For planning purposes, technical medical equipment density may be calculated by relating item density to bed requirements as follows:

For bed requirements of 100.....	Technical medical equipment density is 75.
For bed requirements of 400.....	Technical medical equipment density is 200.
For bed requirements of 1,000.....	Technical medical equipment density is 350.
For bed requirements of 10,000.....	Technical medical equipment density is 3,000.

⁵ Includes services other than scheduled inspections.

⁶ For data pertaining to office machine repair and shoe repair, see SR 310-30-15, appendix IV.

⁷ 1.5 man-hours per man per year.

Table II. Maintenance Time Factors for Quartermaster Air-Type Equipment

	1	2	3	4	5	6
1	Type of equipment	Preventive maintenance		Man-hours required for organizational maintenance	Man-hours required for field maintenance	Minutes required per maintenance inspection
		Minutes required per pack or repack inspection	Minutes required per routine inspection			
2	Aerial delivery containers: A-7A, A-21, and A-22-----			1	1	-----
	Parachutes:					
3	Parachute, cgo extraction, 15- and 22-ft-----	6	2	2	8	20
4	Parachute, cgo, 64-ft-----	-----	2	3	35	90
5	Parachute, cgo, 100-ft-----	-----	2	5	50	120
6	Parachute, cgo, G-1A-----	6	2	3	8	35
7	Parachute, cgo, G-13-----	6	2	3	9	35
8	Parachute, pers, back, 28-ft-----	9	2	2	2	35
9	Parachute, pers, main, 35-ft-----	6	2	2	7	30
10	Parachute, pers, res, 24-ft-----	6	2	1	3	30
11	Parachute, pilot, cgo-type-----	6	2	2	2	20
	Platforms:					
12	Platform, 11-ft-----	-----	-----	2	25	-----
13	Platform, 15-ft-----	-----	-----	2	35	-----
14	Platform, 22-ft, and trk, inf eqp-----	-----	-----	2	40	-----
15	Platform, 6,000-lb-----	-----	-----	2	30	-----

Table III. Common Repair Operations on Quartermaster Air-Type Equipment

	1	2
1	Type of repair	Time required (average)
2	Section replacement (ea)_____	3.5-4 hr.
3	Suspension line replacement (ea)_____	45 min.
4	Patching canopy or canvas (ea)_____	30 min.
5	Harness replacement (ea)_____	30 min.
6	Bridle loop replacement (ea)_____	10 min.
7	Diagonal backstrap replacement (ea)__	1 hr.

8.16. Maintenance Control

a. General. This paragraph outlines a workload control system designed for use by organizational and field maintenance units. The system sets forth the means of computing and controlling the maintenance backlog and general policies applicable thereto. The workload control system is a managerial tool used to balance actual workload against the workload that a maintenance facility is capable of assuming. It is intended to be used as a guide only and must

be flexible in application. The system is based on the fact that a maintenance facility has a certain number of man-hours to expend on the accomplishment of its mission during a given period of time and that the workload should, in general, be limited to that capacity. This permits the programming of work to allow maximum concentration upon a large number of small jobs, if required; a smaller number of large jobs, if desired; or any combination of both.

b. Objectives. The objectives of the workload control system are to establish—

- (1) A criterion or factor, in terms of man-hours, that can be used in determining whether an item can be repaired at the direct support field maintenance level or whether it must be evacuated.
- (2) Criteria or factors, expressed in man-hours, to be used in determining the effectiveness of unit production.

c. Value. The fundamental principle of field maintenance is that all repairs are performed at the lowest echelon practicable. The capacity of field maintenance companies, in terms of productive man-hours, is the limiting

factor that precludes full implementation of this principle. The value of the system is its ability to provide a means of determining that capacity.

d. Factors. The workload control system makes use of the following computations, which make up the basic factors upon which it is based:

- (1) *Man-hours.* The man-hour computation is made by deriving the total number of man-hours actually available from the total number of man-hours theoretically available. *For example*, a repair section has 11 productive item repair personnel assigned. Since it normally works 10 hours per day, there are theoretically 110 item repair man-hours available (10×11). Department of the Army policy and local conditions will determine percentages that must be deducted from this total in order to arrive at the number of man-hours actually available. These percentages cover such nonproductive operations as movement time, administrative activities, maintenance of operating equipment, or other contingencies, and will vary, depending upon the function or work activity involved. As a hypothetical example, an item repair section might actually have available 75 man-hours per day for the function of repair.
- (2) *Workload.* Higher headquarters normally prescribes the workload, expressed in days, authorized to be on hand in the company (or section) at any one time. This usually represents the maximum number of days in which the company should complete the items scheduled for repair. When multiplied by the actual number of man-hours available each day, it represents the total number of actual man-hours available to the company (or section) for a given period of time. *For example*, if the prescribed workload is 3 days, the total number of

actual item repair man-hours available to the section is 225 (3×75).

e. Utilization. Utilization of the workload control system in a repair section of a field maintenance company is described below. The first example illustrates application when a standard repair time factor is available. The second illustrates application when the repair time factor has not been established.

- (1) *Example 1.* The standard repair time factor for the repair of an item is 0.5 man-hours. The prescribed maximum workload for the section is 3 days (225 man-hours). Based on the standard repair time factor, the section can repair 450 items within the 3-day period. The section has on hand four job orders covering a total of 314 items. A new job order (number 5) is received covering 50 items, or 25 man-hours.
 - (a) The workload control system is applied by subtracting the total number of items on hand from the total number that can be repaired within the prescribed 3-day limit (450-314). The resulting figure of 136 items indicates that job order number 5 can be completed within the 3-day limit.
 - (b) If the calculation had indicated that job order number 5 could not be completed within the 3-day limit, the company may have either evacuated the job to the next higher maintenance unit, or assigned the job to the section with the understanding that additional jobs would have to be evacuated until the number of items on hand had been reduced.
- (2) *Example 2.* A standard repair time factor has not been developed for the repair of a certain item. The prescribed maximum workload is 3 days (225 man-hours). The section has on hand 12 job orders for the repair of items requiring an estimated 210 man-hours to complete. A new job order

(number 13) requiring an estimated 25 man-hours to complete is received.

- (a) The workload control system is applied, in this instance, by subtracting the total number of man-hours required to complete the jobs on hand from the total number of man-hours actually available (225-210). The resulting figure of 15 man-hours indicates that job order number 13 cannot be completed within the 3-day limit.
- (b) The company may, therefore, evacuate the job to the next higher maintenance unit, or assign the job to the section with the understanding that no additional jobs can be accepted until the total number of man-hours of work has been reduced.

8.17. Maintenance Float and Direct Exchange Criteria

a. Maintenance float is that quantity of major items of equipment required and authorized

for stockage with direct support maintenance units or fixed field maintenance activities. Such equipment is required for replacement of unserviceable items of equipment for which immediate repair cannot be accomplished by the field maintenance activity. The quantity of equipment authorized to be on hand for this purpose is normally recommended by the technical services and established by the command concerned. Authorizations for maintenance float are established only for certain items of equipment; and for some types, such as medical equipment, there is no requirement. Guidance for establishing maintenance float requirements is published in appropriate Department of the Army supply bulletins.

b. The following table gives the maintenance float authorizations recommended for selected types of equipment in field maintenance units and activities. The factors given are percentages of the total equipment supported by the maintenance activity and are subject to modification by the command concerned, depending upon location, activity, and the supply situation.

1		2
1	Item or type of equipment	Maintenance float (percentage)
	<i>Chemical</i>	
2	Breathing apparatus, compressed air, M15.....	10.0
3	Breathing apparatus, oxy-genr, M13.....	10.0
4	Compressor, reciprocating, power-driven, 7 CFM, M1A1.....	10.0
5	Decon apparatus, power-driven, M3A3.....	10.0
6	Filter unit, gas particulate, elec-mtr driven, ABC, M6.....	5.0
7	Filter unit, gas particulate, gas-eng driven, ABC, M6.....	5.0
8	Filter unit, gas particulate, M7.....	5.0
9	Filter unit, gas particulate, M7A1.....	5.0
10	Filter unit, gas particulate, M8A1.....	10.0
11	Flamethrower, ptbl, M2A1.....	15.0
12	Flamethrower, ptbl, one-shot, M8.....	15.0
13	Genr, smoke, mech, M2A1.....	10.0
14	Genr, smoke, mech, M3A3.....	36.0
15	Genr, smoke, mech, M3A2.....	36.0
16	Genr, smoke, mech, M3A1.....	36.0
17	Heater, water, oil, M1.....	10.0
18	Mask, gas, acid and organic vapors, M10.....	10.0
19	Mask, gas, all-purpose, M11A1.....	10.0
20	Mask, gas, ammonia, M12.....	10.0
21	Mask, protective, fld, M9A1.....	3.5
22	Mask, protective, fld, M6-12-8, for dogs.....	10.0
23	Svc unit, flamethrower, trk-mtd, M4.....	30.0

1	1	2
	Item or type of equipment	Maintenance float (percentage)
	<i>Engineer</i>	
24	Boat, brg erection, 27-ft, gas-eng driven.....	10.0
25	Compressor, trk-mtd, 210 CFM, gas-eng driven.....	10.0
26	Crane-shovel, trk-mtd, 20-ton, $\frac{3}{4}$ cu yd.....	10.0
27	Genr set, ptbl, gas-eng driven, 0.5-10 kw.....	5.0
28	Genr set, diesel-eng driven, 15-30 kw.....	10.0
29	Genr set, diesel-eng driven, 60-kw.....	5.0
30	Grader, road, mtz, diesel-eng driven.....	10.0
31	Loader, scoop-type, diesel-eng driven, 4-wheel, $2\frac{1}{2}$ cu yd.....	5.0
32	Outboard motors (all).....	5.0
33	Saw, chain, gas-eng driven (all).....	10.0
34	Tractor, full-tracked, diesel-eng driven, lt.....	5.0
35	Tractor, full-tracked, diesel-eng driven, med.....	15.0
36	Tractor, full-tracked, diesel-eng driven, hv.....	15.0
	<i>Ordnance</i>	
	Combat-type vehicles:	
37	Carrier, cgo, amph.....	4.0
38	Carrier, pers, full-tracked, armd.....	9.0
39	Gun, twin 40-mm, SP, full-tracked.....	9.0
40	Gun, 90-mm, SP, full-tracked.....	6.0
41	Howitzer, 105-mm, SP, full-tracked.....	6.0
42	Howitzer, 155-mm, SP, full-tracked.....	6.0
43	Howitzer, 8-in., SP, full-tracked.....	5.0
44	Mortar, 4.2-in., SP, full-tracked.....	9.0
45	Tanks (all models).....	9.0
46	Tractor, full-tracked, high-speed.....	8.0
47	Tk recovery vehicles.....	8.0
	Transport-type vehicles:	
48	General purpose, motor-powered.....	10.0
49	Special purpose, motor-powered.....	3.0
50	Special eqp` (ord less loads).....	5.0
51	Tlr and stlr.....	3.0
	Fire control materiel:	
52	Fire con sys, air def, M33.....	10.0
53	Sighting and fire con eqp.....	2.0
54	Watches.....	20.0
	Automatic weapons, air defense and towed artillery:	
55	Gun, 280-mm, hv mtz.....	17.0
56	Trk, gun-lifting, hv, M249 (front), M250 (rear).....	35.0
57	Convl-type air def wpn (all).....	3.0
58	Towed arty.....	3.0
59	AW (less hand and shoulder).....	3.0
60	Small arms (hand and shoulder) ¹	

¹ Battlefield recovery will meet replacement requirements.

c. Criteria for direct exchange replacement are expressed in the number of days an unserviceable item may remain in a maintenance facility without being repaired until it will be exchanged and replaced by a like item from the maintenance float stock of the maintenance facility. These criteria are established and modified as necessary by policy of the Department of the Army and commands concerned, with recommendations and guidance from the technical services. *For example*, the following general policy is used for the establishment, stockage, and operation of direct exchange of repair parts and assemblies for major items of ordnance equipment:

- (1) Items which have a high mortality rate and are reparable by cleaning, adjusting, or by use of repair kits may be placed on a direct exchange basis with using units.
- (2) When a new operation is begun or a new item is added to the direct exchange list, 25 percent of the authorized unit stockage will be used. This

percentage factor may be increased or decreased as the activity or demands dictate. At no time should an excess of 75 percent of unit stockage be placed in the direct exchange section.

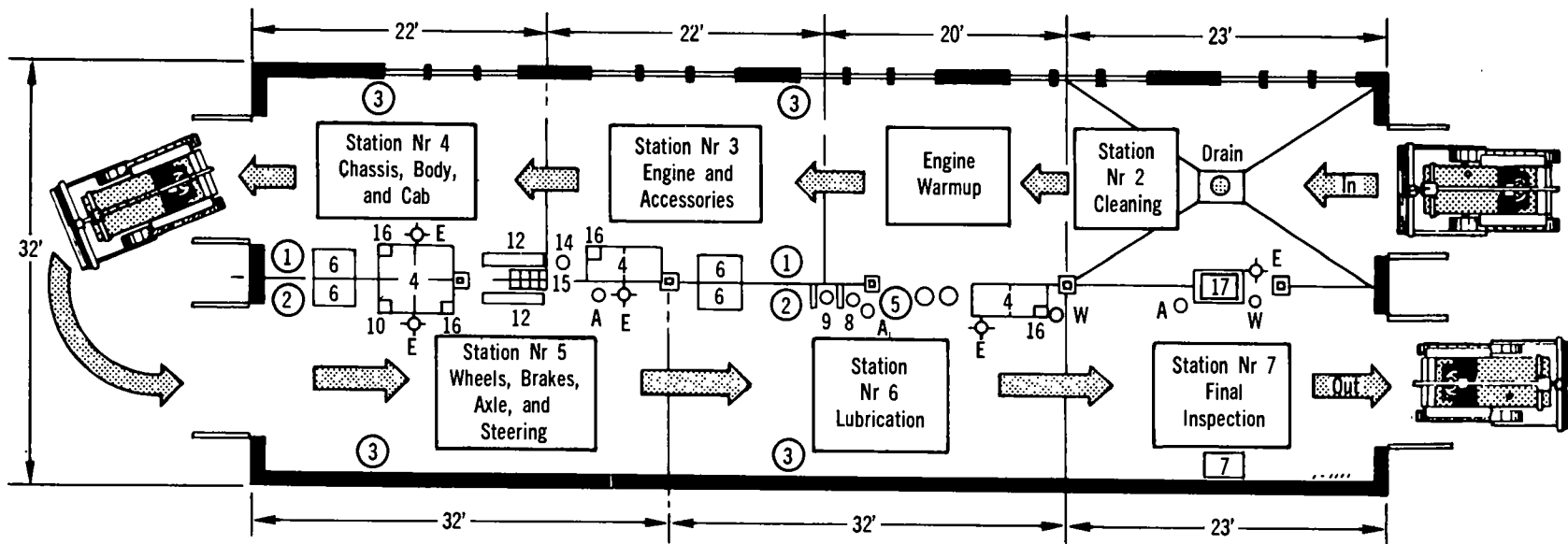
- (3) Direct exchange activities must be reviewed each 30 days to effect adjustment to stockage. As demands decrease, the stockage should also decrease. Seasonal fluctuations in the demand for some items will affect direct exchange stockage; i.e., cause the direct exchange section to be overstocked or understocked. The 75 to 25 percent remaining stockage in the technical supply section will be a buffer to replace items salvaged by the repair shop and deadlines caused by insufficient serviceable items in the direct exchange section.
- (4) The following data should be used as a guide for effecting maintenance float exchange of items of ordnance equipment other than guided missiles and heavy rockets:

	1	2
1	Type of equipment	Down time (days)
2	Combat-type vehicles.....	14
3	Transport-type vehicles.....	5
4	Fire control materiel.....	3
5	Automatic weapons, air defense and towed artillery.....	3
6	Small arms.....	(Immediate exchange on all items).

8.18. Maintenance Facilities and Utilities Requirements

a. Maintenance shops range in size and scope from small-unit shops with organic maintenance responsibilities to large installations capable of complete overhaul and rebuilding of

equipment. The size of the shop and the number of shop sections required are governed by the scope of maintenance activities and responsibilities, shop equipment authorized, and workload. The following is a sample layout for a single-line shop:



CODE

- (A) Air outlets
- (E) Electrical outlets
- (W) Water outlets

- 1. Can, clean rags.
- 2. Can, rubbish.
- 3. Can, rubbish.
- 4. Cabinet, with bench top.
- 5. Pump, oil barrel.
- 6. Compressor, air.
- 7. Desk, office.
- 8. Gun, lub, air-operated.
- 9. Gun, lub, high or low pressure, hand-operated.
- 10. Grinder, bench, electric.

KEY

- 11. Hoist, hyd, pneumatic lift, truck-type, twin post.
- 12. Jack, 10-ton, hyd.
- 13. Reel, lubrication hose.
- 14. Spark plug cleaner.
- 15. Trestle, axle-type, adjustable, 5-ton.
- 16. Vice, 4-in jaw.
- 17. Washer.

b. Most maintenance units are authorized sufficient equipment to provide for their own utilities requirements. In areas where organic power equipment may be supplemented or replaced by local sources of power, planning for adequate power and lighting becomes necessary. For example, it is estimated that 1 watt per square foot of shop floor area is required for

adequate overhead illumination of shop areas. Additional power must be provided for operation of shop machines and equipment, heating, and other uses.

c. Covered shop space requirements for maintenance units are given in the following table:

1	2	3	4
TOE	Unit	Space allowance ¹ (sq ft area)	Overhead clearance (ft)
<i>Chemical</i>			
2 3-47D	Cml maint co.....	4,600	12
3 3-500D	Team FA, maint.....	700	12
4 3-500D	Team FB, maint.....	900	12
5 3-500D	Team FC, maint.....	1,400	12
6 3-500D	Team FD, maint.....	2,000	12
<i>Medical</i>			
7 8-187R	Med dep, COMMZ.....	1,150	10
8 8-667R	Army med dep.....	1,150	10
9 8-500C	Team GC, med eqp maint det.....	530	10
10 8-500C	Team GD, med eqp maint det.....	750	10
11 8-500C	Team GE, med eqp maint det.....	950	10
<i>Ordnance</i>			
12 9-7D	Ord DS co.....	9,800	15
13 9-9D	Ord GS co.....	6,825	15
14 9-127D	Ord dir autmv spt co.....	7,000	15
15 9-167D	Ord coll and clas co.....	6,300	15
16 9-197D	Ord gen autmv spt co.....	10,500	15
<i>Quartermaster</i>			
17 10-377D	Abn div QM preht sup and maint co.....	110,000	14
18 10-338C	QM abn corps preht sup and maint det.....	16,000	14
19 10-347D	QM fld maint co, DS.....	20,000	14
20 10-348D	QM fld maint co, GS.....	25,000	14
21 10-407D	QM aerial sup co.....	130,000	14
22 10-417D	QM air eqp rep and dep co.....	40,000	14
23 10-427C	QM mech and metal rep co.....	50,000	14
24	Each additional augmentation.....	20,000	14
25 10-437R	QM clo and textile rep co.....	75,000	14
26	Each additional augmentation.....	25,000	14

¹ Does not include open storage space that the units will require to support their shop operations.

8.19. Vehicle Losses*

Estimated daily losses in combat divisions of general-purpose vehicles destroyed and evacuated, number per 1,000 of actual vehicle strength:

1	1	2	3	4
	General type of operations for the force as a whole	Destroyed	Require repair by unit maintenance section ¹	Require field or depot maintenance
2	Infantry division in attack of fortified position.....	27	27	15
3	Infantry division in attack of deliberately organized position.....	16	15	11
4	Infantry division in attack of hastily organized position.....	10	10	9
5	Infantry division in covering, security force, retirement, or delaying action.....	5	5	7
6	Infantry division in defense of position.....	9	7	7
7	Infantry division in inactive situation ²	3	2	6
8	Infantry division in pursuit.....	5	5	7
9	Infantry division in assault of hostile shore.....	27	30	20
10	Infantry division in reserve.....	Negl	32	31
11	Armored division in attack.....	16	15	11
12	Armored division in inactive situation ²	3	2	6
13	Armored division in pursuit or exploitation.....	5	8	10
14	Armored division in retirement or delaying action.....	5	5	7
15	Armored division in reserve.....	Negl	32	31

¹ These quantities are in addition to the number in unit maintenance section each day for scheduled servicing.

² Forces in contact, neither side attacking.

³ These figures do not apply during rehabilitation.

*Detailed information is contained in SB 710-1.



CHAPTER 9

LOGISTICS—MANAGEMENT

Section I. GENERAL

9.1. Introduction

This chapter summarizes the detailed data on logistical planning presented in previous chapters. This summary is presented in the form of general logistical planning factors that will be found useful to staff officers at higher levels. It should be noted that these factors apply to

average conditions and situations. They should be used only as a first approximation in logistical planning or as “rule of thumb” checks against the calculations of technical planners. Specific situations may require widely different factors.

9.2 Organizational Factors—Theater Slices

a. Division Slices.

	1	2	3	4	5	6
1	Composition of slice by assignment of troops		Percentage of slice		Composition of slice by location of troops	
	Assignment	Troops	Theater	Combat zone	Troops	Location
2	Basic division.....	13,960	32	43	20,000	Division area.
3	Corps and field army troops.....	18,540	43	57	12,500	Corps and field army rear areas.
4	Communications zone and theater overhead.....	10,750	25	-----	10,750	Communications zone.
5	Total.....	43,250	100	100	43,250	

b. Airwing Slices.

	1	2	3	4	5
1	Composition of slice by assignment of troops		Percentage of slice	Composition of slice by location of troops	
2	Air Force combat organization.....	2,550	36	-----	Division area.
3	Miscellaneous Air Force support units.....	3,450	50	-----	Corps and field army rear areas.
4	Army communications zone troops ¹	1,000	14	7,000	Communications zone.
5	Total.....	7,000	100	7,000	

¹ Army troops required within the theater because of the presence of Air Force elements, which are provided Army administrative support.

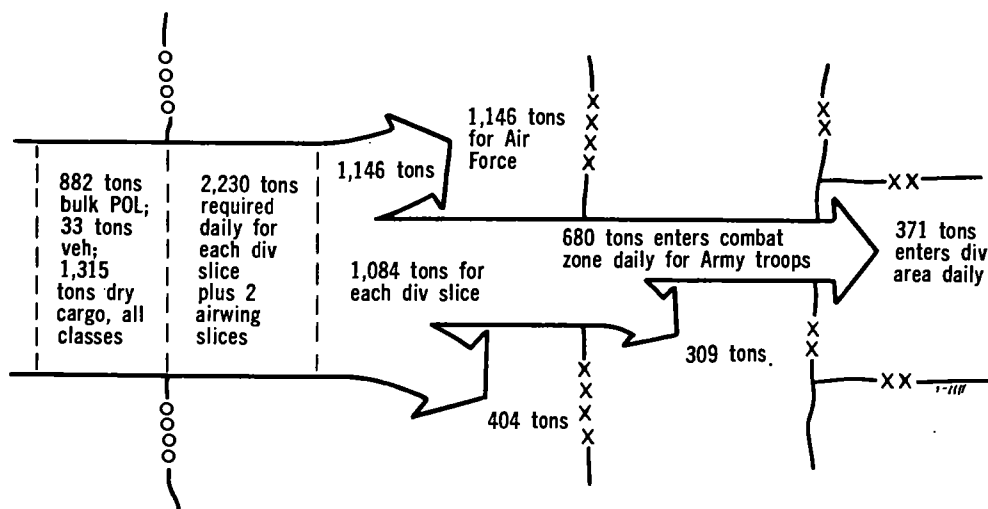
c. Figures on Slices. Detailed figures on slices appear in paragraphs 4.1 through 4.7.

Section II. LOGISTICAL FACTORS

9.3. Supply Factors

These factors are for use as broad initial planning factors. They do not include tonnages involved in buildup of theater reserves.

a. Maintenance, short tons per day, for each division slice plus two airwing slices.



b. Maintenance, Pounds Per Man Per Day.

	1	2	3	4	5
1	Item	Consumed per man in theater (Army plus AF)	Consumed by Army in theater, per Army man in theater	Consumed by Army in combat zone, per Army man in combat zone	Consumed by Army in division areas, per Army man in such areas
2	Bulk POL.....	31	10	10	5
3	Vehicles.....	1 (-)	1 (-)	1	1 (+)
4	Dry cargo.....	46	39	31	31 (-)
5	Total.....	78	50 (-)	42	37

c. Initial Equipment Plus 30 Days' Maintenance.

	1	2	3
1	Item	Measurement tons per man in the theater (Army plus AF)	Short tons per man in the theater (Army plus AF)
2	Initial equipment.....	8.00	1.80
3	30 days' maintenance dry cargo.....	1.35	0.75
4	30 days' maintenance bulk POL.....	¹ 0.43	0.30
5	Total.....	9.78	2.85

¹ Bulk petroleum normally is not expressed in measurement tons. This figure is provided for the purpose of comparison with dry cargo. Bulk petroleum represents 90 percent of all petroleum shipped to the theater. The remaining 10 percent is shipped packaged and is included in dry cargo.

9.4. Evacuation and Hospitalization Factors

	1	2
	Kind of hospitalization	Quantity required ¹
	Mobile hospitals:	
2	Evac, smbl.....	1 per div and 2 per corps.
3	Mbl army surg.....	1 per div.
4	Fixed-hospital beds in the theater of operations.	7 percent of theater of operations strength....

¹ These factors are valid only for conventional warfare operations. For factors applicable to nuclear warfare, see FM 101-10, part III, chapter 2.

9.5. Transportation Factors

a. Capacities of Transportation Mediums:

	1	2	3	4	5
1	Medium		Short tons per day	Long tons per day	Adequate to maintain
2	Highways (average)-----	Gravel-----	1,000	890	2 divisions.
3	-----	Medium condition-----	2,500	2,230	Corps of 4 divisions.
4	-----	First-class-----	8,000	7,140	Field army of 8-12 divisions.
5	Railways each way-----	Single-track-----	4,000	3,570	2 corps totaling 5-8 divisions.
6	-----	Double-track-----	12,000	10,700	Field army of 12-18 divisions.
7	Pipeline-----	4-in. (inside diameter)-----	910	810	1 corps of 4 divisions.
8	-----	6-in.-----	2,000	1,800	2 corps of 8 divisions.
9	-----	8-in.-----	3,480	3,100	1 type field army.
10	-----	12-in.-----	18,300	16,430	5 type field armies.
11	Discharge rate-----	Average cargo ship-----	720	633	
12	Across beaches-----	Per 1,000 yards of beach-----	1,680	1,500	
13	Capacities of average cargo ship-----			10,000 measurement tons or 5,000 long tons of Army cargo. ¹	
14	Capacities of average train in theater of operations-----			1,000 troops or 400 short tons of cargo.	

¹ See paragraph 7.48n.

b. Transportation Requirements of the Infantry Division.

1		2		
1	Type	Requirement		
2	Highway.....	5 trans light trk companies in addition to organic transport.		
3	Air.....	Approximately 781 C-130 type aircraft sorties and 374 C-124 type aircraft sorties are required to air-land an infantry division. This is a lift of approximately 18,000 tons. For detailed data, see FM 7-100.		
4	Amphibious operation....	Average strength of an <i>assault division</i> , including shore party and other attached and supporting elements, is 25,000 men with 5,000 vehicles. If 75 percent of the vehicles of the infantry division and attached and supporting elements are loaded out with the division in assault shipping, the requirements in assault shipping for a reinforced division in an amphibious operation are—		
		Type	Extended voyage (10 days)	Short voyage (2-3 days)
		APA (auxiliary transport, attack).....	10	1
		AKA (cargo ship, attack).....	2	2
		LST (landing ship, tank).....	25	50
		LSD (landing ship, dock).....	7	7
		LPH (landing platform, helicopter).....	6	6

9.6. Service Factors

a. *Service Troop Factors.* Service troops equal approximately 40 percent of division slice; 60 percent of service units are in communications zone, 40 percent in combat zone.

b. *Equipment Factors.* One vehicle for five

or six men in a balanced force.

9.7. Legal Services

Past experiences indicate the following workloads may be expected in oversea theaters in times of hostilities.

a. Workload Per 10,000 Men.

	1	2	3	4	5
1	Area of responsibility	GCM's/mo	Claims/mo	War crimes incidents/mo	Legal assistance matters/mo
2	Combat zone.....	^{1 2} 6	³ 25	⁴ 15	30-50
3	Communications zone.....	^{1 2} 9	³ 150	⁴ 10	100-150

¹ The incidence of general courts-martial may vary as much as 100 per-cent above the average stated without being considered abnormal.

² It may be expected that for each general court-martial in a command there will be 7.7 special courts-martial and 12.7 summary courts-martial.

³ The rate of claims resulting from the presence of a given number of troops in a theater will depend on whether the area is industrialized or rural and on the population density of the area. These rates are appropriate for planning operations in Europe.

⁴ Although the enemy troop strength would be the source of the war crimes, for planning purposes our strength may be assumed to vary as the enemy strength varies.

b. *Judge Advocate General Corps Teams (TOE 27-500D).* These teams may be employed to augment organic judge advocate sections when needed.

	1	2
1	Unit ¹	Work unit/month
2	JAGC claims svc team FA.....	75-100 claims.
3	JAGC war crimes team GA.....	10-15 incidents.
4	JAGC GCM trial team HA.....	10-15 GCM ² .
5	JAGC GCM trial team HB.....	20-25 GCM ² .
6	JAGC legal asst team IA.....	100-150 cases.
7	JAGC procurement law teams ³	-----

¹ For capabilities, assignment, strength, basis of allocation, etc., of the teams listed in this table, see FM 101-10, part II.

² This figure comprehends trial only, administrative details being handled by organic staff sections

³ Team JA (contract law), team JB (property law), team JC (frauds), team JD (labor relations), and team JE (fiscal law)

CHAPTER 10

MISCELLANEOUS

Section I. CONVERSION FACTORS

10.1. Weight

	1	2	3	4	5	6
1	Unit	Long tons	Metric tons	Short tons	Kilograms	Pounds
2	1 long ton =		1.0160	1.1200	1,016.0	2,240.0
3	1 metric ton =	0.9842		1.1023	1,000.0	2,204.6
4	1 short ton =	0.8929	0.9072		907.2	2,000.0
5	1 kilogram =					2.2046

10.2. Speed

	1	2	3	4	5	6	7	8
1	Unit	Knots	Statute miles per hour	Kilometers per hour	Feet per minute	Feet per second	Meters per minute	Meters per second
2	1 knot ¹ =		1.1516	1.8532	101.34	1.6890	30.89	0.5148
3	1 mile per hr =	0.8684		1.6093	88.00	1.4667	26.82	0.4470
4	1 km per hr =	0.5396	0.6214		54.68	0.9113	16.67	0.2778

¹ One knot — 1 nautical mile per hour.

10.3. Power

	1	2	3	4	5	6
1	Unit	Kilowatts	Horsepower	Btu ¹ per min	Ft lb per sec	Ft lb per min
2	1 kilowatt =		1.34100	56.88	737.600	44,250.0
3	1 horsepower =	0.7457		42.42	550.000	33,000.0
4	1 Btu ¹ per min =	0.01758	0.02358		12.968	778.1

¹ Btu, or British thermal unit, is the quantity of heat required to raise the temperature of 1 pound of water 1° F.

10.4. Angular Conversions

	1	2	3	4	5
1	Unit	Radians	Degrees	Mils	Minutes
2	1 radian =		57.30	1,018.600	
3	1 degree =	0.17453		17.778	60.000
4	1 mil =		0.05625		3.375

Note. 360° = 2 π radians = 6,400 mils.

10.5. Linear Measure

	1	2	3	4	5	6	7	8	9	10	11
1	Unit	Nautical miles	Statute miles	Kilometers	Cable lengths	Fathoms	Meters	Yards	Feet	Inches	Centimeters
2	1 nautical mile =		1.1516	1.8532	8.455	1,013.4	1,853.2	2,026.8	6,080.27	72,963.0	185,325.0
3	1 statute mile =	0.8684		1.6093	7.333	880.0	1,609.3	1,760.0	5,280.0	63,360.0	160,933.0
4	19 kilometer =	0.5396	0.6214		4.557	546.8	1,000.0	1,093.6	3,281.0	39,370.0	100,000.0
5	1 cable length =	0.1184	0.1364	0.2195		120.0	219.5	240.0	720.0	8,640.0	21,945.0
6	1 fathom =						1.829	2.0	6.0	72.0	182.88
7	1 meter =					0.5468		1.0936	3.281	39.37	100.0
8	1 yard =					0.5000	0.9144		3.0	36.0	91.44
9	1 foot =					0.1667	0.3048	0.3333		12.0	30.48
10	1 inch =								0.0833		2.54
11	1 centimeter =								0.0328	0.3937	

10.6. Surface

	1	2	3	4	5	6	7	8	9
1	Unit	Square miles	Square kilometers	Hectares	Acres	Square rods	Square meters	Square yards	Square feet
2	1 square mile =		2.59	259.0	640.0	102,400.0	2,589,945.0	3,097,600.0	
3	1 square kilometer =	0.3861		100.0	247.1	39,537.0	1,000,000.0	1,196,010.0	
4	1 hectare =		0.010		2.471	395.4	10,000.0	11,960.0	107,641.0
5	1 acre =			0.4047		160.0	4,047.0	4,840.0	43,560.0
6	1 square rod =						25.29	30.25	272.25
7	1 square meter =					0.03954		1.1960	10.764
8	1 square yard =					0.03306	0.8361		9.000

10.7. Volume

	1	2	3	4	5	6
1	Unit	Cubic feet	Imperial gallons	U.S. gallons	Liters	Quarts
2	1 cubic foot = -----		6.229	7.481	28.32	29.92
3	1 imperial gallon = -----	0.16054		1.2010	4.546	4.804
4	1 U.S. gallon = -----	0.13368	0.8327		3.785	4.000
5	1 liter = -----	0.03532	0.2201	0.2642		1.0567
6	1 measurement ton = -----	40.0				
7	1 barrel (petroleum) = -----	5.61		42.0		

Section II. PHYSICAL CONSTANTS

10.8. Speed of Sound

	1	2	3	4	5	6	7	8
1	Unit	In air (at degrees F.)					In water	
		10°	0°	30°	70°	100°	Fresh	Salt
2	Feet per sec = -----	1,039	1,050	1,083	1,127	1,171	4,700	4,752
3	Miles per hr = -----	708	716	738	768	797	3,205	3,246

10.9. Speed of Light

The speed of light is approximately 186,000 miles per second.

10.10. Acceleration Due to Gravity

Acceleration due to gravity is 32.2 feet per second per second.

10.11. Atmospheric Pressure

Atmospheric pressure is 14.7 pounds per square inch. This is equal to the pressure ex-

erted by a column of water 33.9 feet high, which is the theoretical maximum height to which water may be drawn by suction.

10.12. Circumference of the Earth at the Equator

The circumference of the earth at the equator is 24,902 miles.

10.13. Time Between Moons

Time between moons is 29 days, 12 hours, 44 minutes.

APPENDIX

REFERENCES

FM 3-5	Tactics and Techniques of Chemical, Biological, and Radiological (CBR) Warfare.
FM 3-8	Chemical Corps Reference Handbook.
FM 5-1	Engineer Troop Organization and Operations.
FM 5-15	Field Fortifications.
FM 5-22	Camouflage Materials.
FM 5-25	Explosives and Demolitions.
FM 5-26	Employment of Atomic Demolition Munition (ADM) (U).
FM 5-30	Engineer Intelligence.
FM 5-35	Engineers' Reference and Logistical Data.
FM 5-36	Route Reconnaissance and Classification.
FM 6-20	Field Artillery Tactics and Techniques.
FM 6-61	Field Artillery Missile Battalion, HONEST JOHN Rocket, Self-Propelled.
FM 6-61A	Field Artillery Missile Battalion, HONEST JOHN Rocket, Self-Propelled (U).
FM 7-24	Communication in Infantry and Airborne Divisions.
FM 7-100	Infantry Division.
FM 8-55	Army Medical Service Planning Guide.
FM 9-1	Ordnance Service in the Field.
FM 9-2	Ordnance Corps Logistical Data.
FM 9-5	Ordnance Ammunition Service.
FM 11-16	Signal Orders, Records, and Reports.
FM 11-17	Tactical Communications Center Operation.
FM 11-20	Organizations and Operations in the Corps, Army, Theater of Operations, and GHQ.
FM 11-22	Signal Operations in the Corps and Army.
FM 11-40	Signal Corps Pictorial Operations.
FM 11-51	Signal Air Photo Reproduction and Delivery Company (TOE 11-54 ()).
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FM 21-6	Techniques of Military Instruction.
FM 21-26	Map Reading.
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FM 24-20	Field Wire and Field Cable Techniques.
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FM 30-9	Battalion, Field Army.
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FM 30-10	Terrain Intelligence.
FM 30-16	Technical Intelligence (U).
FM 31-12	Army Forces in Amphibious Operations (The Army Landing Force)..
FM 31-10	Barriers and Denial Operations.
FM 38-1	Logistics Supply Management.
FM 55-21	Rail Transportation Higher Units.

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FM 55-51	Transportation Terminal Commands, Theater of Operations.
FM 55-52	Transportation Terminal Battalion and Terminal Service Company.
FM 55-53	Transportation Amphibious Truck Company.
FM 55-54	Highway Capability Estimating Guide.
FM 55-58	Transportation Boat Units.
FM 57-30	Airborne Operations.
FM 57-100	The Airborne Division.
FM 60-30	Amphibious Operations; Embarkation and Ship Loading (Unit Loading Officer).
FM 100-5	Field Service Regulations; Operations.
FM 100-10	Field Service Regulations; Administration.
FM 100-11	Signal Communications Doctrine.
FM 101-1	Staff Officers' Field Manual; The G1 Manual.
FM 101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
FM 101-10	Staff Officers' Field Manual; Organization, Technical, and Logistical Data; Extracts of Tables of Organization and Equipment.
Part II	
FM 101-10	Staff Officers' Field Manual; Organization, Technical, and Logistical Data; Classified Data (U).
Part III	
FM 105-5	Maneuver Control.
TM 3-200	Capabilities and Employment of Toxic Chemicals.
TM 5-210	Military Floating Bridge Equipment.
TM 5-231	Mapping Functions of the Corps of Engineers.
TM 5-236-series	The American Ephemeris and Nautical Almanac (current year).
TM 5-240	A Guide to the Compilation and Revision of Maps.
TM 5-243	Cartographic Aerial Photography.
TM 5-245	Map Reproduction.
TM 5-248	Foreign Maps.
TM 5-250	Roads and Airfields.
TM 5-252	Use of Road and Airfield Construction Equipment.
TM 5-260	Principles of Bridging.
TM 5-277	Panel Bridge, Bailey Type, M2.
TM 5-285	Semipermanent Highway Steel Bridges, 30-, 60-, and 90-Foot Spans.
TM 5-286	Semipermanent Highway and Railway Trestle Bridges.
TM 5-301	Staff Tables of Engineer Functional Components System.
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TM 5-360	Port Construction and Rehabilitation.
TM 5-370	Railroad Construction.
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TM 5-374	Light Standard and Standard Unit Steel Trestles.
TM 5-505	Maintenance of Engineer Equipment.
TM 5-700	Field Water Supply.
TM 5-4310-203-10	Operator's Manual: Compressor, Air, Reciprocating, Trailer Mounted, 15 CFM, 3,500 PSI, Joy Model 15 HGP5-MS-1, W Wisconsin Engine Model MVF4D (FSN 4310-624-3212).
TM 5-4310-211-10	Operator's Manual: Compressor, Air, Reciprocating, GED, Truck Mounted, 80 CFM, 5,000 PSI (Joy Model 80-HGC2-MS-1 and 80-HGC3-MS-1) W Engine Hercules Model WXLD-ER, FSN 4310-620-5985 and 4310-620-5986.

TM 5-4310-214-10	Operator's Manual: Compressor, Rotary-Reciprocating, Power Driven: Air; Wheel Mounted, 4 Wheel, Pneumatic Tires; Electric Motor, AC, 220/440 V; 3 Phase, 60 Cycle, 15 HP; 15 CFM; 3,500 PSI, Air Transportable; Phase III (Davey Model RPC-15) (FSN 4310-627-9030).
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TM 5-5398-1	Compressor, Air, Skid Mounted, Gasoline Driven, 13 CFM, 3,500 PSI, Rix Model 1262 (Less Engine).
TM 5-9132	Auger, Earth, Skid-Mounted, Gasoline, Highway Trailer Model HDM-S With Continental Engine, Model PF-226.
TM 9-1900	Ammunition, General.
TM 9-1903	Care, Handling, Preservation, and Destruction of Ammunition.
TM 9-1940	Land Mines.
TM 9-2200	Small Arms Materiel and Associated Equipment.
TM 9-2300	Artillery Materiel and Associated Equipment.
TM 9-2350-201-12	Operation and Organizational Maintenance 76-mm Gun Full Tracked Combat Tanks M41 (T41E1) and M41A1 (T41E2).
TM 9-2350-210-12	Operation and Organizational Maintenance: 155-mm Self-Propelled Gun Cannon M53 (T97) and 8-inch Self-Propelled Howitzer Cannon M55 (T108).
TM 9-2800	Military Vehicles.
TM 9-2810	Preventive Maintenance, Supply, Inspection, and Training Procedures: Tactical Motor Vehicle.
TM 9-7204	Operation and Organizational Maintenance: Howitzer, Light, Full Tracked, 105-mm, M52 (T98E1) (2350-733-3216) and M52A1 (2350-563-7967).
TM 10-500	Air Delivery of Supplies and Equipment: General.
TM 10-1100-series	Petroleum Pipeline and Terminal Operating Procedures and Techniques (as appropriate).
TM 10-1619	Quartermaster Materials Handling Equipment.
TM 30-245	Photographic Interpretation Handbook.
TM 30-246	Tactical Interpretation of Air Photos.
TM 57-210	Air Movement of Troops and Equipment.
TM 743-200	Storage and Materials Handling.
TB AVN 2	Recommended and Alternate Grade Fuels, Engine and Transmission Oils for Army Aircraft-Engine Combinations.
TB ENG 56	Requisitions for Stockpile Railway Bridges and Trestles.
AR 10-5	Organization and Functions: Department of the Army.
AR 11-8	Logistics Policies and Priorities (U).
AR 55-21	General Passenger Traffic Procedures Applicable to Procurement of Transportation and Accommodations.
AR 55-355	Military Traffic Management Regulation.
AR 117-5	Military Mapping and Surveying.
AR 220-10	Preparation for Oversea Movement of Units (POM).
AR 220-50	Regiments; General Provisions.
AR 220-60	Battalions, Battle Groups, Squadrons; General Provisions.
AR 220-70	Companies; General Provisions.
AR 230-5	General Policies.
AR 310-3	Military Publications; Preparation and Processing.
AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.

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AR 385-63	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
AR 700-12	Control, Supply, and Positioning of Materiel.
AR 701-9100-1	Petroleum Supply System.
AR 743-41	Shed and Open Storage of Supplies.
AR 750-4	Major Overhaul Policy and Program for Oversea Commands.
AR 750-5	Maintenance Responsibilities and Shop Operations.
AR 785-10	Acquisition, Expansion, Utilization, and Allocation of Supply and Storage Space.
SR 210-20-20	Training Areas and Facilities for Ground Troops.
SR 310-30-15	Organization and Equipment Authorization Tables Personnel.
SR 742-607-1	Serviceability Standards for Classification of Technical Medical Equipment.
DA Pam 44-2	NIKE Handbook (U).
DA Pam 44-3	HAWK Data Book (U).
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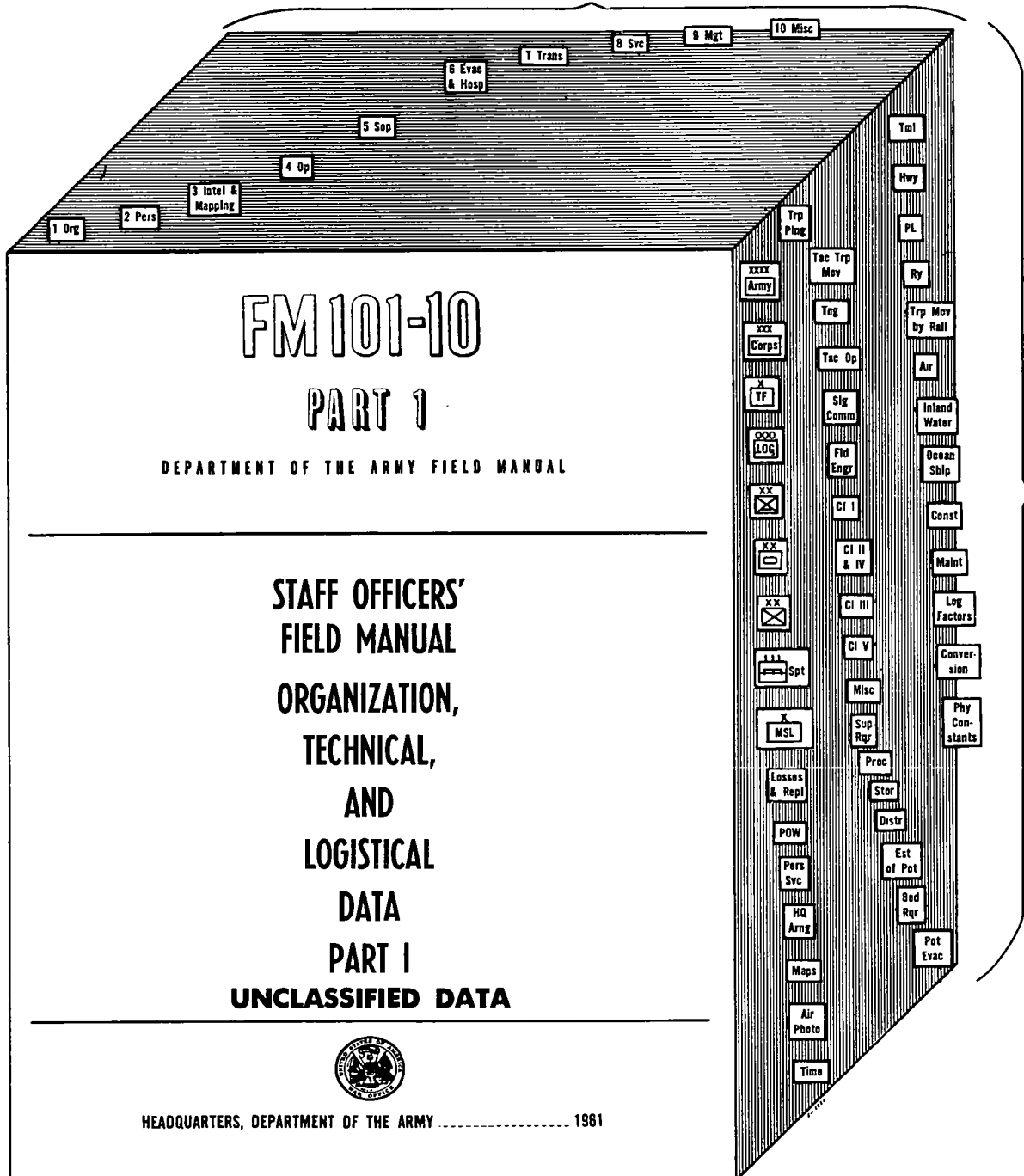
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